R&S®FSW-K82/-K83
CDMA2000® Measurements
User Manual

1173.9334.02 ─ 07

Test & Measurement

User Manual

ROHDE&SCHWARZ

This manual applies to the following R&S®FSW models with firmware version 1.70 and higher:

- R&S®FSW8 (1312.8000K08)
- R&S®FSW13 (1312.8000K13)
- R&S®FSW26 (1312.8000K26)
- R&S®FSW43 (1312.8000K43)
- R&S®FSW50 (1312.8000K50)

The following firmware options are described:

- R&S FSW-K82 (1313.1468.02)
- R&S FSW-K83 (1313.1474.02)

The firmware of the instrument makes use of several valuable open source software packages. For information, see the "Open Source Acknowledgement" on the user documentation CD-ROM (included in delivery).
Rohde & Schwarz would like to thank the open source community for their valuable contribution to embedded computing.

© 2013 Rohde & Schwarz GmbH & Co. KG
Mühldorfstr. 15, 81671 München, Germany
Phone: +49 89 41 29 - 0
Fax: +49 89 41 29 12 164
E-mail: info@rohde-schwarz.com
Internet: www.rohde-schwarz.com
Subject to change – Data without tolerance limits is not binding.
R&S® is a registered trademark of Rohde & Schwarz GmbH & Co. KG.
CDMA2000® is a registered trademark of the Telecommunications Industry Association (TIA -USA).
Trade names are trademarks of the owners.

The following abbreviations are used throughout this manual: R&S®FSW is abbreviated as R&S FSW. R&S®FSW-K82 / R&S®FSW-K83 is abbreviated as R&S FSW-K82/-K83

Contents

1 Preface....7
1.1 About this Manual....7
1.2 Documentation Overview....8
1.3 Conventions Used in the Documentation....9
2 Welcome to the CDMA2000 Applications....11
2.1 Starting the CDMA2000 Applications....12
2.2 Understanding the Display Information....12
3 Measurements and Result Displays....15
3.1 Code Domain Analysis....15
3.2 RF Measurements....28
4 Measurement Basics....36
4.1 PCGs and Sets....36
4.2 Channels, Codes and Symbols....36
4.3 Code Display and Sort Order....38
4.4 Scrambling via PN Offsets and Long Codes....40
4.5 Code Mapping and Branches....40
4.6 Radio Configuration....41
4.7 Transmission with Multiple Carriers and Multiple Antennas....41
4.8 Channel Detection and Channel Types....43
4.9 Test Setup for CDMA2000 Tests....45
4.10 CDA Measurements in MSRA Operating Mode....47
5 I/Q Data Import and Export....50
5.1 Import/Export Functions....50
6 Configuration....52
6.1 Result Display....52
6.2 Code Domain Analysis....53
6.3 RF Measurements....102
7 Analysis....107
7.1 Code Domain Analysis Settings....107

7.2 Evaluation Range....109
7.3 Traces....111
7.4 Markers....112
8 Optimizing and Troubleshooting the Measurement....119
8.1 Error Messages....119
9 How to Perform Measurements in CDMA2000 Applications....120
10 Measurement Examples....124
10.1 Meas 1: Measuring the Signal Channel Power....124
10.2 Meas 2: Measuring the Spectrum Emission Mask....125
10.3 Meas 3: Measuring the Relative Code Domain Power and Frequency Error....126
10.4 Meas 4: Measuring the Triggered Relative Code Domain Power....128
10.5 Meas 5: Measuring the Composite EVM....129
10.6 Meas 6: Measuring the Peak Code Domain Error and the RHO Factor....130
11 Remote Commands for CDMA2000 Measurements....133
11.1 Introduction....133
11.2 Common Suffixes....138
11.3 Activating the Measurement Channel....138
11.4 Selecting a Measurement....142
11.5 Configuring Code Domain Analysis....143
11.6 Configuring RF Measurements....199
11.7 Configuring the Result Display....200
11.8 Starting a Measurement....209
11.9 Retrieving Results....214
11.10 General Analysis....236
11.11 Importing and Exporting I/Q Data and Results....245
11.12 Configuring the Application Data Range (MSRA mode only)....246
11.13 Querying the Status Registers....248
11.14 Commands for Compatibility....250
A Annex - Reference Data....253
A.1 Reference: Predefined Channel Tables....253
A.2 Reference: Code Tables....256
A.3 Reference: Supported Bandclasses....259

A.4 Reference: I/Q Data File Format (iq-tar)....260
A.5 Abbreviations....265
List of Remote Commands (CDMA2000)....267
Index....272

1 Preface

1.1 About this Manual

This R&S FSW-K82/-K83 User Manual provides all the information **specific to the CDMA2000 applications**. All general instrument functions and settings common to all applications and operating modes are described in the main R&S FSW User Manual.

The main focus in this manual is on the measurement results and the tasks required to obtain them. The following topics are included:

- **Welcome to the CDMA2000 Measurements Application**
  Introduction to and getting familiar with the application
- **Measurements and Result Displays**
  Details on supported measurements and their result types
- **Measurement Basics**
  Background information on basic terms and principles in the context of the measurement
- **Configuration + Analysis**
  A concise description of all functions and settings available to configure measurements and analyze results with their corresponding remote control command
- **I/Q Data Import and Export**
  Description of general functions to import and export raw I/Q (measurement) data
- **Optimizing and Troubleshooting the Measurement**
  Hints and tips on how to handle errors and optimize the test setup
- **How to Perform Measurements in CDMA2000 Applications**
  The basic procedure to perform each measurement and step-by-step instructions for more complex tasks or alternative methods
- **Measurement Examples**
  Detailed measurement examples to guide you through typical measurement scenarios and allow you to try out the application immediately
- **Remote Commands for CDMA2000 Measurements**
  Remote commands required to configure and perform CDMA2000 measurements in a remote environment, sorted by tasks
  (Commands required to set up the environment or to perform common tasks on the instrument are provided in the main R&S FSW User Manual)
  Programming examples demonstrate the use of many commands and can usually be executed directly for test purposes
- **Annex**
  Reference material
- **List of remote commands**
  Alphabetical list of all remote commands described in the manual
- **Index**

1.2 Documentation Overview

The user documentation for the R&S FSW consists of the following parts:

- "Getting Started" printed manual
- Online Help system on the instrument
- Documentation CD-ROM with:
  - Getting Started
  - User Manuals for base unit and options
  - Service Manual
  - Release Notes
  - Data sheet and product brochures

Online Help

The Online Help is embedded in the instrument's firmware. It offers quick, context-sensitive access to the complete information needed for operation and programming. Online help is available using the icon on the toolbar of the R&S FSW.

Getting Started

This manual is delivered with the instrument in printed form and in PDF format on the CD. It provides the information needed to set up and start working with the instrument. Basic operations and handling are described. Safety information is also included.

The Getting Started manual in various languages is also available for download from the R&S website, on the R&S FSW product page at http://www2.rohde-schwarz.com/product/FSW.html.

User Manuals

User manuals are provided for the base unit and each additional (software) option.

The user manuals are available in PDF format - in printable form - on the Documentation CD-ROM delivered with the instrument. In the user manuals, all instrument functions are described in detail. Furthermore, they provide a complete description of the remote control commands with programming examples.

The user manual for the base unit provides basic information on operating the R&S FSW in general, and the Spectrum application in particular. Furthermore, the software functions that enhance the basic functionality for various applications are described here. An introduction to remote control is provided, as well as information on maintenance, instrument interfaces and troubleshooting.

In the individual application manuals, the specific instrument functions of the application are described in detail. For additional information on default settings and parameters, refer to the data sheets. Basic information on operating the R&S FSW is not included in the application manuals.

All user manuals are also available for download from the R&S website, on the R&S FSW product page at http://www2.rohde-schwarz.com/product/FSW.html.

Service Manual

This manual is available in PDF format on the CD delivered with the instrument. It describes how to check compliance with rated specifications, instrument function, repair, troubleshooting and fault elimination. It contains all information required for repairing the R&S FSW by replacing modules.

Release Notes

The release notes describe the installation of the firmware, new and modified functions, eliminated problems, and last minute changes to the documentation. The corresponding firmware version is indicated on the title page of the release notes.

The most recent release notes are also available for download from the R&S website, on the R&S FSW product page at http://www2.rohde-schwarz.com/product/FSW.html > Downloads > Firmware.

1.3 Conventions Used in the Documentation

1.3.1 Typographical Conventions

The following text markers are used throughout this documentation:

Convention	Description
"Graphical user interface elements"	All names of graphical user interface elements on the screen, such as dialog boxes, menus, options, buttons, and softkeys are enclosed by quotation marks.
KEYS	Key names are written in capital letters.
`File names, commands, program code`	File names, commands, coding samples and screen output are distinguished by their font.
Input	Input to be entered by the user is displayed in italics.
Links	Links that you can click are displayed in blue font.
"References"	References to other parts of the documentation are enclosed by quotation marks.

1.3.2 Conventions for Procedure Descriptions

When describing how to operate the instrument, several alternative methods may be available to perform the same task. In this case, the procedure using the touchscreen is described. Any elements that can be activated by touching can also be clicked using an additionally connected mouse. The alternative procedure using the keys on the instrument or the on-screen keyboard is only described if it deviates from the standard operating procedures.

The term "select" may refer to any of the described methods, i.e. using a finger on the touchscreen, a mouse pointer in the display, or a key on the instrument or on a keyboard.

2 Welcome to the CDMA2000 Applications

The CDMA2000 options are firmware applications that add functionality to the R&S FSW to perform measurements on downlink or uplink signals according to the CDMA2000 standard.

R&S FSW-K82 performs **B**ase **T**ransceiver **S**tation (**BTS**) measurements on forward link signals on the basis of the 3GPP2 Standard (Third Generation Partnership Project 2).

R&S FSW-K83 performs **M**obile **S**tation (MS) measurements on reverse link signals on the basis of the 3GPP2 Standard (Third Generation Partnership Project 2).

The measurements are based on the "Physical Layer Standard for CDMA2000 Spread Spectrum Systems Release C" of version C.S0002-C V1.0 dated May 2002 and "Recommended Minimum Performance Standard for CDMA2000 Spread Spectrum Base Stations" of version C.S0010-B dated December 2002. This standard has been adopted by the following authorities with the specified norm:

TIA: TIA/EIA-97-E dated February 2003 (also known as IS-97-E)

Reference made to the CDMA2000 specification in the following text alludes to these standards.

The application firmware R&S FSW-82 supports radio configurations 1 to 5 and 10. Thus, IS95A/B signals conforming to radio configurations 1&2 can also be measured with this application firmware. Channels and modulation types of the 1xEV– DV enhancement are supported as well.

The application firmware R&S FSW-83 supports the radio configurations 3 and 4. Apart from CDMA2000 reverse link signals, the 1xEV-DV reverse link channels of Release C are also supported. Code Domain Analysis is also possible at signals where the pilot channel is active in at least one of the captured power control groups (pilot gating).

In addition to the code domain measurements described in the CDMA2000 standard, the CDMA2000 applications feature measurements in the spectral range such as channel power, adjacent channel power, occupied bandwidth and spectrum emission mask with predefined settings.

This user manual contains a description of the functionality that the applications provide, including remote control operation.

All functions not discussed in this manual are the same as in the base unit and are described in the R&S FSW User Manual.

The latest version is available for download at the product homepage (http://www2.rohde-schwarz.com/product/FSW.html).

Installation

You can find detailed installation instructions in the R&S FSW Getting Started manual or in the Release Notes.

2.1 Starting the CDMA2000 Applications

The CDMA2000 measurements require special applications on the R&S FSW.

To activate the CDMA2000 applications

1. Press the MODE key on the front panel of the R&S FSW.

   A dialog box opens that contains all operating modes and applications currently available on your R&S FSW.

2. Select the "cdma2000 BTS" or "cdma2000 MS" item.

   The R&S FSW opens a new measurement channel for the CDMA2000 application.

The measurement is started immediately with the default settings. It can be configured in the CDMA2000 "Overview" dialog box, which is displayed when you select the "Overview" softkey from any menu (see chapter 6.2.2, "Configuration Overview", on page 55).

Multiple Measurement Channels and Sequencer Function

When you activate a CDMA2000 application, a new measurement channel is created which determines the measurement settings for that application. The same application can be activated with different measurement settings by creating several channels for the same application.

The number of channels that can be configured at the same time depends on the available memory on the instrument.

Only one measurement can be performed at any time, namely the one in the currently active channel. However, in order to perform the configured measurements consecutively, a Sequencer function is provided.

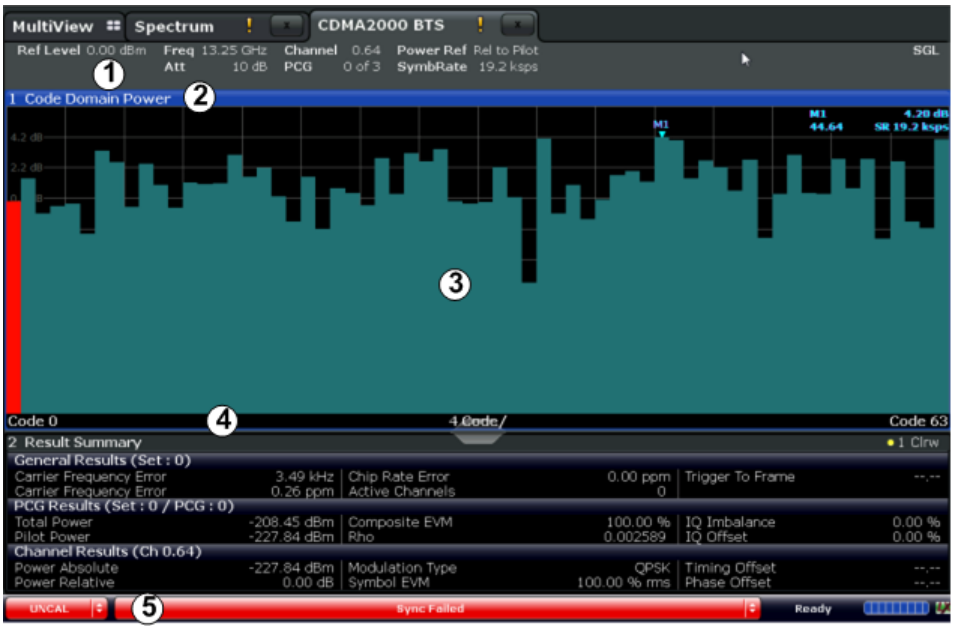
If activated, the measurements configured in the currently active channels are performed one after the other in the order of the tabs. The currently active measurement is indicated by a ✿ symbol in the tab label. The result displays of the individual channels are updated in the tabs (including the "MultiView") as the measurements are performed. Sequential operation itself is independant of the currently *displayed* tab.

For details on the Sequencer function see the R&S FSW User Manual.

2.2 Understanding the Display Information

The following figure shows a measurement diagram in the CDMA2000 BTS application. All different information areas are labeled. They are explained in more detail in the following sections.

(The basic screen elements are identical in the CDMA2000 MS application.)



1 = Channel bar for firmware and measurement settings
2 = Window title bar with diagram-specific (trace) information
3 = Diagram area with marker information
4 = Diagram footer with diagram-specific information, depending on measurement
5 = Instrument status bar with error messages, progress bar and date/time display

MSRA operating mode

In MSRA operating mode, additional tabs and elements are available. A colored background of the screen behind the measurement channel tabs indicates that you are in MSRA operating mode. RF measurements are not available in MSRA operating mode.

For details on the MSRA operating mode see the R&S FSW MSRA User Manual.

Channel bar information

In CDMA2000 applications, the R&S FSW shows the following settings:

Table 2-1: Information displayed in the channel bar in CDMA2000 applications

Ref Level	Reference level
Freq	Center frequency for the RF signal
Att	Mechanical and electronic RF attenuation
Channel	Channel number (code number and spreading factor)
PCG	Power control group (see chapter 4.1, "PCGs and Sets", on page 36)
Power Ref	Reference used for power results
SymbRate	Symbol rate of the currently selected channel

In addition, the channel bar also displays information on instrument settings that affect the measurement results even though this is not immediately apparent from the display

of the measured values (e.g. transducer or trigger settings). This information is displayed only when applicable for the current measurement. For details see the R&S FSW Getting Started manual.

Window title bar information

For each diagram, the header provides the following information:

Fig. 2-1: Window title bar information in CDMA2000 applications

1 = Window number
2 = Window type
3 = Trace color
4 = Trace number
5 = Detector

Diagram footer information

The diagram footer (beneath the diagram) contains the following information, depending on the evaluation:

Status bar information

Global instrument settings, the instrument status and any irregularities are indicated in the status bar beneath the diagram. Furthermore, the progress of the current operation is displayed in the status bar.

3 Measurements and Result Displays

The CDMA2000 applications provide several different measurements for signals according to the CDMA2000 standard. The main and default measurement is Code Domain Analysis. In addition to the code domain power measurements specified by the CDMA2000 standard, the CDMA2000 applications offer measurements with predefined settings in the frequency domain, e.g. RF power measurements.

For details on selecting measurements see "Selecting the measurement type" on page 52.

Evaluation methods

The captured and processed data for each measurement can be evaluated with various different methods. All evaluation methods available for the selected CDMA2000 measurement are displayed in the evaluation bar in SmartGrid mode.

The evaluation methods for CDA are described in chapter 3.1.2, "Evaluation Methods for Code Domain Analysis", on page 18.

- Code Domain Analysis.....15
- RF Measurements.....28

3.1 Code Domain Analysis

The CDMA2000 firmware applications feature a Code Domain Analyzer. It can be used used to perform the measurements required in the CDMA2000 standards with regard to the power of the different codes and code channels (concentrated codes). In addition, the modulation quality (EVM and RHO factor), frequency errors and trigger–to–frame time, as well as the peak code domain errors are determined. Constellation evaluations and bitstream evaluations are also available. Furthermore, the timing and phase offsets of the channels to the pilot can also be calculated. The observation period can be set as multiples of the power control group (PCG).

Basically, the firmware differentiates between the following result classes for the evaluations:

- Results which take the overall signal into account over the whole observation period (all PCGs)
- Results which take the overall signal into account over a power control group (PCG)
- Results which take one channel into account over the whole observation period (all PCGs)
- Results which take one channel into account over a power control group (PCG)

Remote command:

`CONF:CDP:MEAS CDP`, see `CONFigure:CDPower[:BTS]:MEASurement` on page 142

- Code Domain Parameters....16
- Evaluation Methods for Code Domain Analysis....18

3.1.1 Code Domain Parameters

In the Result Summary, three different types of measurement results are determined and displayed:

- General results for the current set
- PCG results for the current set and PCG
- Channel results for the selected channel

In the Channel Table, channel results for *all* channels are displayed.

General Results

Under "General Results", the measurement results that concern the total signal (that is, all channels) for the entire period of observation (that is, all PCGs) are displayed:

Table 3-1: General code domain power results for the current set

Parameter	Description
Carrier Frequency Error	Shows the frequency error referred to the center frequency of the R&S FSW. The absolute frequency error is the sum of the frequency error of the R&S FSW and that of the device under test. Frequency differences between the transmitter and receiver of more than 1.0 kHz impair synchronization of the Code Domain Power measurement. If at all possible, the transmitter and the receiver should be synchronized. The frequency error is available in the units Hz or ppm referred to the carrier frequency.
Chip Rate Error	Shows the chip rate error (1.2288 Mcps) in ppm. A large chip rate error results in symbol errors and, therefore, in possible synchronization errors for Code Domain Power measurements. This measurement result is also valid if the R&S FSW could not synchronize to the CDMA2000 signal.
Trigger to Frame	Reflects the time offset from the beginning of the recorded signal section to the start of the first PCG. In case of triggered data recording, this corresponds to the timing offset: *timing offset = frame trigger (+ trigger offset) – start of first PCG* If it was not possible to synchronize the R&S FSW to the CDMA2000 signal, this measurement result is meaningless. For the "Free Run" trigger mode, dashes are displayed.
Active Channels	Specifies the number of active channels found in the signal. Detected data channels as well as special channels are regarded as active. With transmit diversity, the result applies to the selected Antenna Diversity - Antenna Number.

PCG Results

PCG results concern the total signal (that is, all channels) for the selected PCG.

Table 3-2: Code domain power results for the current PCG

Parameter	Description
Total Power	Shows the total power of the signal.
Pilot Power	Shows the power of the pilot channel. If antenna 2 is selected, the power of the F-TDPICH is displayed, in all other cases that of the F-PICH. For details on antenna selection refer to "Antenna Diversity - Antenna Number" on page 58.
RHO	Shows the quality parameter RHO. According to the CDMA2000 standard, RHO is the normalized, correlated power between the measured and the ideally generated reference signal. When RHO is measured, the CDMA2000 standard requires that only the pilot channel be supplied.
Composite EVM	The composite EVM is the difference between the test signal and the ideal reference signal. For further details refer to the Composite EVM result display.
IQ Imbalance	Shows the IQ imbalance of the signal in %.
Offset	Shows the IQ offset of the signal in %.

Channel results

In the Result Summary, channel results of the selected channel and the selected PCG are displayed.

In the Channel Table, channel results for *all* channels are displayed. For details see "Channel Table" on page 19.

Not all channel results displayed in the Result Summary are also displayed in the Channel Table and vice versa.

Table 3-3: Channel-specific parameters

Parameter	Description
Channel	Channel number including the spreading factor (in the form <Channel>.<SF>)
Modulation Type	**(BTS application only):** Displays the modulation type of the channel and PCG: BPSK, QPSK, 8PSK, or 16QAM
Mapping	**(MS application only):** Indicates the selected branch (I or Q)
Phase Offset	Phase offset between the selected channel and the pilot channel If enabled (see "Timing and phase offset calculation " on page 108), the maximum value of the phase offset is displayed together with the associated channel in the last two lines. Since the phase offset values of each active channel can be either negative or positive, the absolute values are compared and the maximum is displayed with the original sign.
Power Absolute	Absolute (dBm) power of the channel
Power Relative	Relative (dB) power of the channel (refers either to the pilot channel or the total power of the signal)

Parameter	Description
Symbol EVM	Peak or mean value of the EVM measurement result For further details refer to the result display "Symbol EVM" on page 27.
Timing Offset	Timing offset between the selected channel and the pilot channel If enabled (see "Timing and phase offset calculation " on page 108), the maximum value of the timing offset is displayed together with the associated channel in the last two lines. Since the timing offset values of each active channel can be either negative or positive, the absolute values are compared and the maximum is displayed with the original sign.

3.1.2 Evaluation Methods for Code Domain Analysis

The captured I/Q data can be evaluated using various different methods without having to start a new measurement. All evaluation methods available for the selected CDMA2000 measurement are displayed in the evaluation bar in SmartGrid mode.

To activate SmartGrid mode, do one of the following:

-

  Select the "SmartGrid" icon from the toolbar.
- Select the "Display Config" button in the configuration "Overview".
- Select the "Display Config" softkey from the MEAS CONFIG menu.

To close the SmartGrid mode and restore the previous softkey menu select the "Close" icon in the righthand corner of the toolbar, or press any key on the front panel.

The selected evaluation not only affects the result display, but also the results of the trace data query (see `TRACe<n>[:DATA]?` on page 218).

The Code Domain Analyzer provides the following evaluation methods for measurements in the code domain:

Bitstream....18
Channel Table....19
└ Table Configuration....20
Code Domain Power / Code Domain Error Power....21
Composite Constellation....22
Composite EVM....23
Peak Code Domain Error....24
Power vs PCG....25
Power vs Symbol....25
Result Summary....26
Symbol Constellation....26
Symbol EVM....27

Bitstream

The "Bitstream" evaluation displays the demodulated bits of a selected channel over a selected PCG.

All bits that are part of inactive channels are marked as being invalid using dashes.

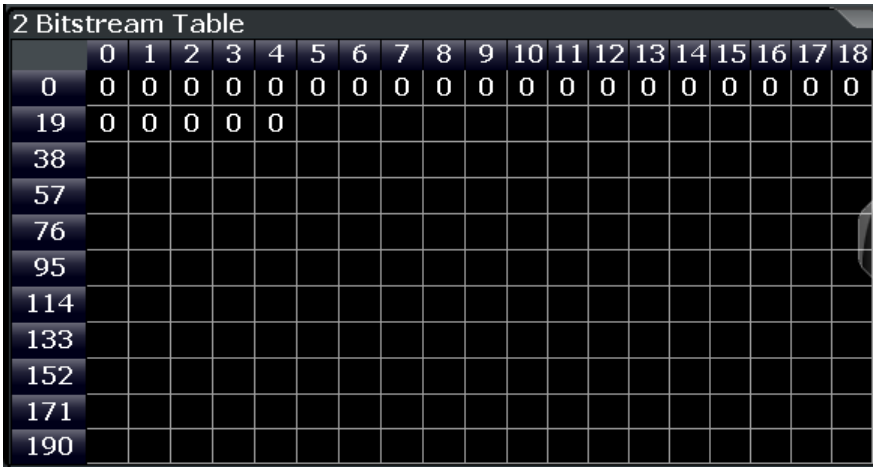


Fig. 3-1: Bitstream result display for the BTS application

To select a specific symbol press the MKR key. If you enter a number, the marker jumps to the selected symbol. If there are more symbols than the screen is capable of displaying, use the marker to scroll inside the list.

The number of symbols per PCG depends on the spreading factor (symbol rate) and the antenna diversity. The number of bits per symbol depends on the modulation type.

For details see chapter 4, "Measurement Basics", on page 36.

Remote command:
`LAY:ADD? '1',RIGH, 'XTIM:CDP:BSTR'`, see `LAYout:ADD[:WINDow]?` on page 201

Channel Table
The "Channel Table" evaluation displays the detected channels and the results of the code domain power measurement over the selected PCG. The analysis results for all channels are displayed. Thus, the Channel Table may contain up to 128 entries, corresponding to the highest base spreading factor of 128.

The first entries of the table indicate the channels that must be available in the signal to be analyzed and any other control channels (PICH, SYNC etc.).

The lower part of the table indicates the data channels that are contained in the signal.

If the type of a channel can be fully recognized, based on pilot sequences or modulation type, the type is indicated in the table. In the BTS application, all other channels are of type CHAN.

The channels are in descending order according to symbol rates and, within a symbol rate, in ascending order according to the channel numbers. Therefore, the inactive codes are always displayed at the end of the table (if "Show inactive channels" is enabled, see "Table Configuration" on page 20.

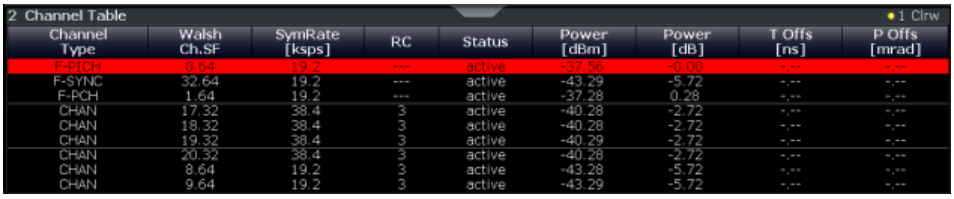
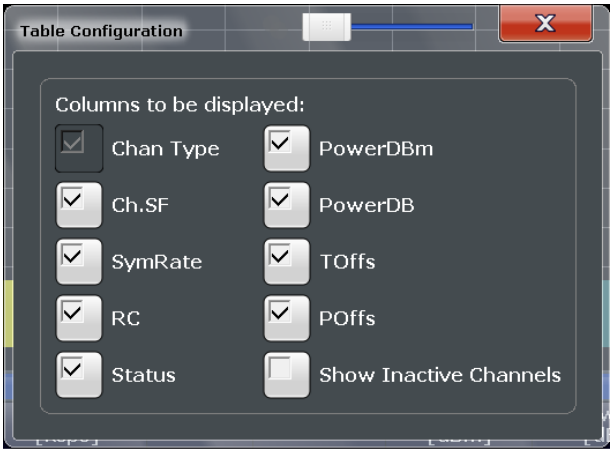

2 Channel Table
1 Clrw
Channel Type
Walsh Ch.SF
SymRate [ksps]
RC
Status
Power [dBm]
Power [dB]
T Offs [ns]
P Offs [mrad]
F-PICH 0.64 19.2 --- active -37.56 -0.00 -,-- -,--
F-SYNC 32.64 19.2 --- active -43.29 -5.72 -,-- -,--
F-PCH 1.64 19.2 --- active -37.28 0.28 -,-- -,--
CHAN 17.32 38.4 3 active -40.28 -2.72 -,-- -,--
CHAN 18.32 38.4 3 active -40.28 -2.72 -,-- -,--
CHAN 19.32 38.4 3 active -40.29 -2.72 -,-- -,--
CHAN 20.32 38.4 3 active -40.28 -2.72 -,-- -,--
CHAN 8.64 19.2 3 active -43.28 -5.72 -,-- -,--
CHAN 9.64 19.2 3 active -43.29 -5.72 -,-- -,--

Fig. 3-2: Channel Table display for the BTS application

Remote command:
`LAY:ADD? '1',RIGH, CTABle`, see `LAYout:ADD[:WINDow]?` on page 201

Table Configuration ← Channel Table
You can configure which parameters are displayed in the Channel Table by double-clicking the table header. A "Table Configuration" dialog box is displayed in which you select the columns to be displayed.



By default, only active channels are displayed. In order to display all channels, including the inactive ones, enable the "Show Inactive Channels" option.

The following parameters of the detected channels are determined by the CDP measurement and can be displayed in the Channel Table result display. (For details see chapter 3.1.1, "Code Domain Parameters", on page 16.)

Table 3-4: Code domain power results in the channel table

Parameter	Description
Channel Type	Shows the channel type ('---' for inactive channels)
Walsh Ch.SF	Channel number including the spreading factor (in the form <Channel>.<SF>)
(P Offs [mrad])	Phase offset between the selected channel and the pilot channel If enabled (see "Timing and phase offset calculation " on page 108), the maximum value of the phase offset is displayed together with the associated channel in the last two lines. Since the phase offset values of each active channel can be either negative or positive, the absolute values are compared and the maximum is displayed with the original sign.
Pwr [dBm])	Absolute (dBm) power of the channel
Pwr [dB]	Relative (dB) power of the channel (refers either to the pilot channel or the total power of the signal)

Parameter	Description
RC	**(BTS application only):** Radio configuration
Mapping	**(MS application only):** Branch the data is mapped to
Status	Channel status; Unassigned codes are identified as inactive channels
Symbol Rate [ksps]	Symbol rate at which the channel is transmitted (9.6 ksps to 307.2 ksps)
(T Offs [ns])	Timing offset between the selected channel and the pilot channel If enabled (see "Timing and phase offset calculation " on page 108), the maximum value of the timing offset is displayed together with the associated channel in the last two lines. Since the timing offset values of each active channel can be either negative or positive, the absolute values are compared and the maximum is displayed with the original sign.

Code Domain Power / Code Domain Error Power
The "Code Domain Power" evaluation shows the power of all possible code channels in the total signal over the selected PCG.

"Code Domain Error Power" is the difference in power between the measured and the ideal signal.

The x-axis represents the channel (code) number, which corresponds to the base spreading factor. The y-axis is a logarithmic level axis that shows the (error) power of each channel. With the error power, both active and inactive channels can be evaluated at a glance.

Both evaluations support either Hadamard or BitReverse code sorting order (see chapter 4.3, "Code Display and Sort Order", on page 38).

MS application only: the (error) power is calculated only for the selected branch (I or Q).

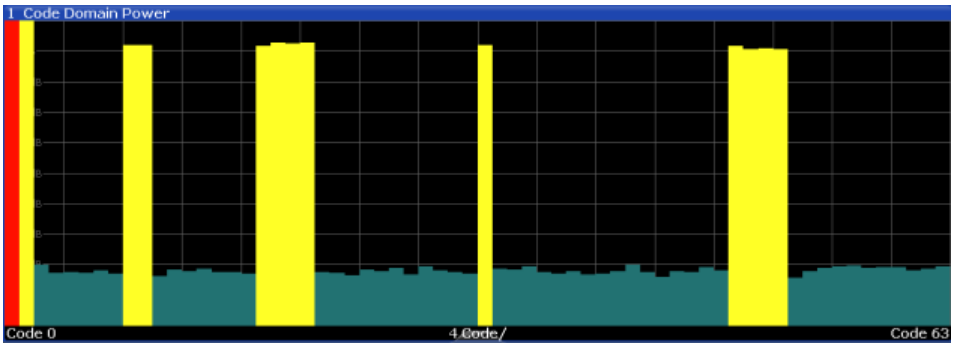


Fig. 3-3: Code Domain Power Display for the BTS application

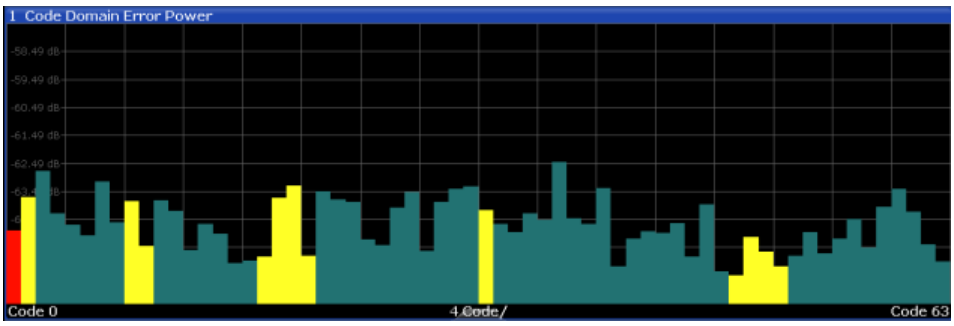


Fig. 3-4: Code Domain Error Power result display for the MS application

Active and inactive data channels are defined via the Inactive Channel Threshold. The power values of the active and inactive channels are shown in different colors. In addition, codes with alias power can occur (see "Alias power" on page 39).

Table 3-5: Assignment of colors in CDEP result display

Color	Usage
Red	Selected channel (code number)
Yellow	Active channel
Green	Inactive channel
Light blue	Alias power of higher spreading factor
Magenta	Alias power as a result of transmit diversity

Note: If codes with alias power are displayed, set the highest base spreading factor available in the Base Spreading Factor field.
It is not recommended that you select more detailed result displays (such as "Symbol Constell") for unassigned or inactive codes, since the results are not valid.

Remote command:
CDP:
`LAY:ADD? '1',RIGH, CDPower`, see `LAYout:ADD[:WINDow]?` on page 201
`CALC:MARK:FUNC:CDP:RES? CDP` or `CALC:MARK:FUNC:CDP:RES? CDPR`; see `CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult?` on page 215
CDEP:
`LAY:ADD? '1',RIGH, CDEPower`, see `LAYout:ADD[:WINDow]?` on page 201
`CALC:MARK:FUNC:CDP:RES? ` ; see `CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult?` on page 215.

Composite Constellation

In "Composite Constellation" evaluation the constellation points of the 1536 chips are displayed for the specified PCG. This data is determined inside the DSP even before the channel search. Thus, it is not possible to assign constellation points to channels. The constellation points are displayed normalized with respect to the total power.

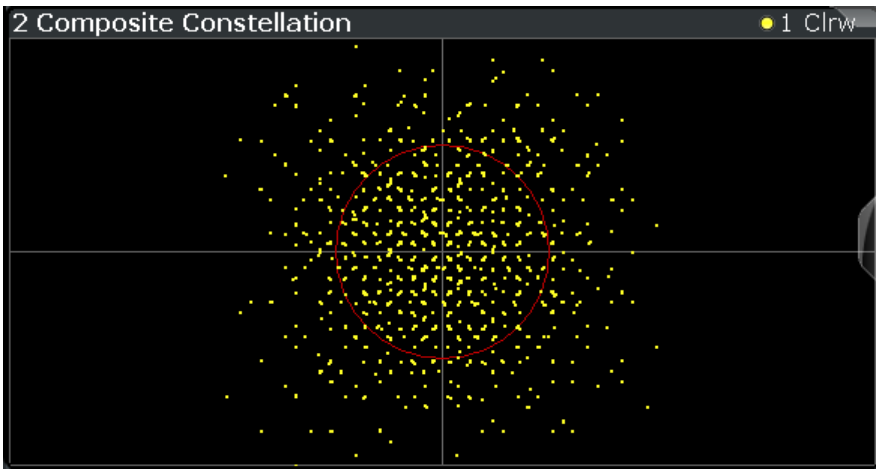


Fig. 3-5: Composite Constellation display for the BTS application

Remote command:
`LAY:ADD? '1',RIGH, CCON`, see `LAYout:ADD[:WINDow]?` on page 201
`CALC:MARK:FUNC:CDP:RES?` ; see `CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult?` on page 215

Composite EVM
This result display measures the modulation accuracy. It determines the error vector magnitude (EVM) over the total signal. The EVM is the root of the ratio of the mean error power (root mean square) to the power of an ideally generated reference signal. Thus, the EVM is shown in %. The diagram consists of a composite EVM for each PCG.

The measurement evaluates the total signal over the entire period of observation. The selected PCG is highlighted red. You can set the number of PCGs in the "Signal Capture" settings (see "Number of PCGs" on page 88).

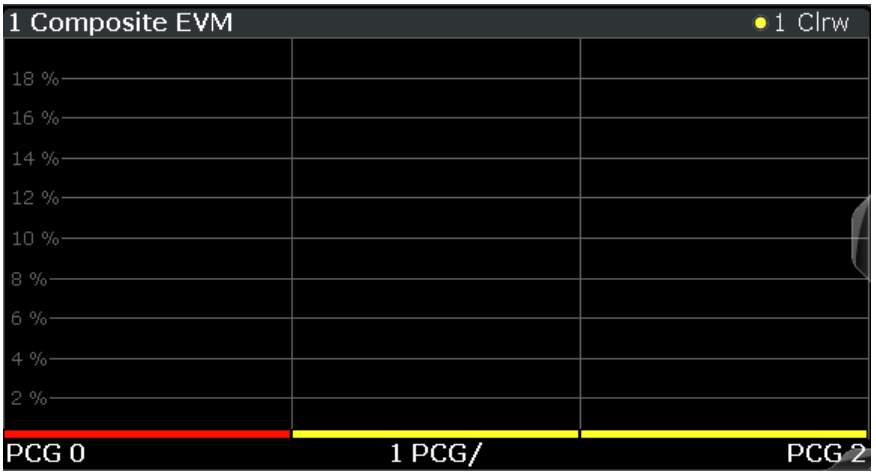


Fig. 3-6: Composite EVM result display

Only the channels detected as being active are used to generate the ideal reference signal. If a channel is not detected as being active, e.g. on account of low power, the difference between the test signal and the reference signal and therefore the composite EVM is very large. Distortions also occur if unassigned codes are wrongly given the status of "active channel". To obtain reliable measurement results, select an adequate channel threshold via the Inactive Channel Threshold setting.

Remote command:
`LAY:ADD? '1',RIGH, CEVM`, see `LAYout:ADD[:WINDow]?` on page 201
`CALC:MARK:FUNC:CDP:RES? MACCuracy`; see `CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult?` on page 215

Peak Code Domain Error
The Peak Code Domain Error is defined as the maximum value for the Code Domain Power / Code Domain Error Power for all codes. Thus, the error between the measurement signal and the ideal reference signal is projected onto the code domain at a specific base spreading factor. In the diagram, each bar of the x-axis represents one PCG. The y-axis represents the error power.

The measurement evaluates the total signal over the entire period of observation. The currently selected PCG is highlighted red.

You can select the Base Spreading Factor and the number of evaluated PCGs in the Signal Capture settings (see "Number of PCGs" on page 88).

MS application: the error is calculated only for the selected branch (I or Q).

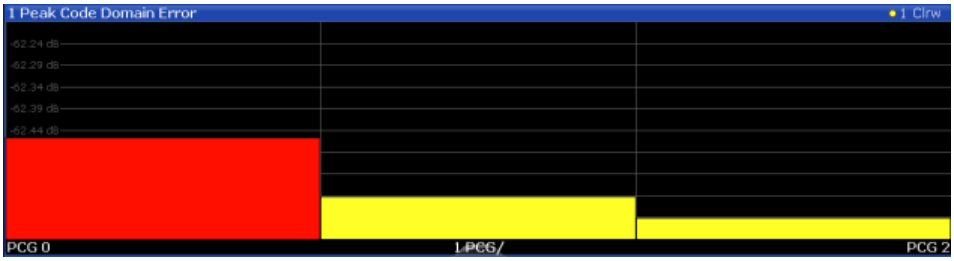


Fig. 3-7: Peak Code Domain Error display for the BTS application

Note: Only the channels detected as being active are used to generate the ideal reference signal. If a channel is not detected as being active, e.g. on account of low power, the difference between the test signal and the reference signal is very large. The result display therefore shows a peak code domain error that is too high. Distortions also occur if unassigned codes are wrongly given the status of "active channel". To obtain reliable measurement results, select an adequate channel threshold via the Inactive Channel Threshold setting.

Remote command:
`LAY:ADD? '1',RIGH, PCDerror`, see `LAYout:ADD[:WINDow]?` on page 201
`CALC:MARK:FUNC:CDP:RES? PCDerror`; see `CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult?` on page 215

Power vs PCG
In this result display, the power of the selected channel is averaged for each measured PCG and referred to the pilot power of the PCG. Therefore the unit of the y-axis is dB (relative to the Pilot Channel). The result display consists of the number of the PCGs in the measurement and the power value of each one.

For measurements in which antenna diversity is inactive (OFF) or set to "Antenna 1", the F-PICH channel is used as reference, while the F-TDPICH channel is used for measurements in which antenna diversity is set to "Antenna 2".

Note: For signals with enabled power control, use the default reference power setting. For details refer to "Power Reference" on page 108.

The measurement evaluates one code channel over the entire period of observation. The selected PCG is highlighted red.

MS application: the power is calculated only for the selected branch (I or Q).

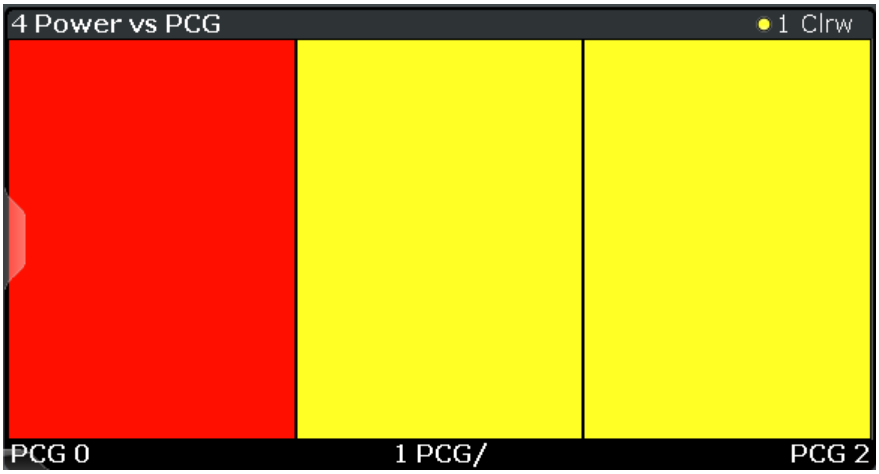


Fig. 3-8: Power vs PCG Display for the BTS application

Note: To detect the start of a power control group correctly, the external trigger must be used for power-regulated signals.

Remote command:
`LAY:ADD? '1',RIGH, PSLot`, see `LAYout:ADD[:WINDow]?` on page 201

Power vs Symbol
The "Power vs. Symbol" evaluation calculates the absolute power in dBm for each symbol in the selected channel and the selected PCG.

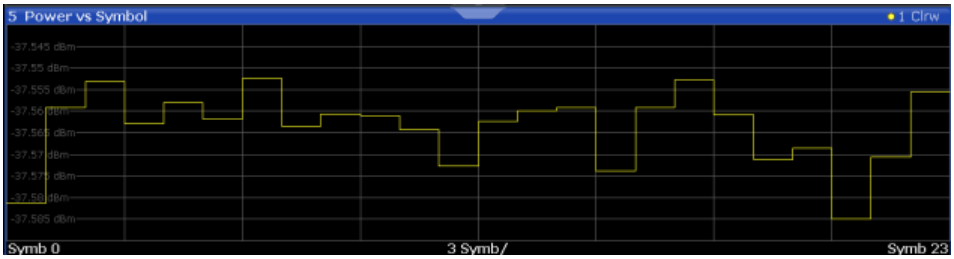


Fig. 3-9: Power vs Symbol result display

Remote command:
`LAY:ADD? '1',RIGH, PSYMbol`, see `LAYout:ADD[:WINDow]?` on page 201
`CALC:MARK:FUNC:CDP:RES?` ; see `CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult?` on page 215

Result Summary
The "Result Summary" evaluation displays a list of measurement results on the screen. For details on the displayed values see chapter 3.1.1, "Code Domain Parameters", on page 16.

2 Result Summary
1 Clrw
General Results (Set : 0)
Carrier Frequency Error -0.01 Hz
Carrier Frequency Error -0.00 ppm
Chip Rate Error -0.20 ppm
Active Channels 9
Trigger To Frame --.--
PCG Results (Set : 0 / PCG : 0)
Total Power -30.56 dBm
Pilot Power -37.56 dBm
Composite EVM 0.48 %
Rho 0.999979
IQ Imbalance 0.09 %
IQ Offset 0.09 %
Channel Results (Ch 0.64)
Power Absolute -37.56 dBm
Power Relative 0.00 dB
Modulation Type BPSK
Symbol EVM 0.12 % rms
Timing Offset --.--
Phase Offset --.--

Fig. 3-10: Result Summary result display

Remote command:
`LAY:ADD? '1',RIGH, RSUMmary`, see `LAYout:ADD[:WINDow]?` on page 201
`CALC:MARK:FUNC:CDP:RES?` ; see `CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult?` on page 215

Symbol Constellation
The "Symbol Constellation" evaluation shows all modulated symbols of the selected channel and the selected PCG.

The BTS application supports BPSK, QPSK, 8PSK and 16QAM modulation types. The modulation type itself depends on the channel type. Refer to chapter 4.8.1, "BTS Channel Types", on page 43 for further information.

Note: QPSK constellation points are located on the diagonals (not x and y-axis) of the constellation diagram. BPSK constellation points are always on the x-axis.

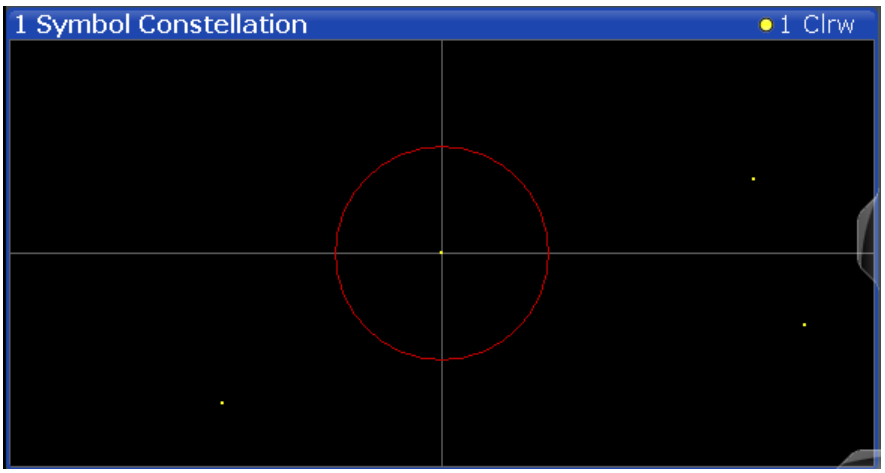


Fig. 3-11: Symbol Constellation display for the BTS application

The number of symbols is in the range from 6 (min) to 384 (max), depending on the symbol rate of the channel (see chapter 4, "Measurement Basics", on page 36).

Remote command:
`LAY:ADD? '1',RIGH, SCONst`, see `LAYout:ADD[:WINDow]?` on page 201
`CALC:MARK:FUNC:CDP:RES?` ; see `CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult?` on page 215

Symbol EVM
The "Symbol EVM" evaluation shows the error between the measured signal and the ideal reference signal in percent for the selected channel and the selected PCG. A trace over all symbols of a PCG is drawn.

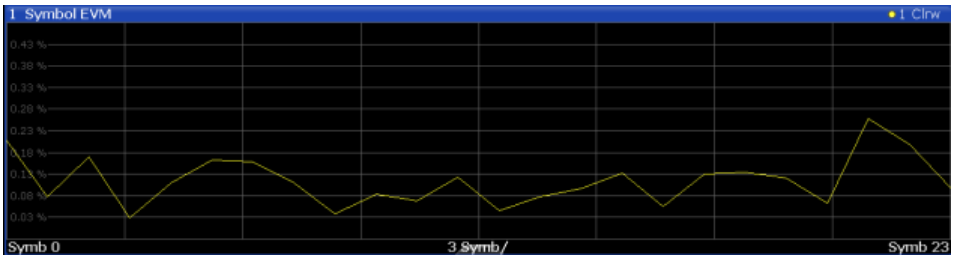


Fig. 3-12: Symbol EVM display for the BTS application

The number of symbols is in the range from 6 (min) to 384 (max), depending on the symbol rate of the channel (see chapter 4, "Measurement Basics", on page 36).

Inactive channels can be measured, but the result is meaningless since these channels do not contain data.

Remote command:
`LAY:ADD? '1',RIGH, SEVM`, see `LAYout:ADD[:WINDow]?` on page 201
`CALC:MARK:FUNC:CDP:RES?` ; see `CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult?` on page 215

3.2 RF Measurements

In addition to the Code Domain Analysis measurements, the CDMA2000 firmware applications also provide some RF measurements as defined in the CDMA2000 standard. RF measurements are identical to the corresponding measurements in the base unit, but configured according to the requirements of the CDMA2000 standard.

For details on these measurements see the R&S FSW User Manual.

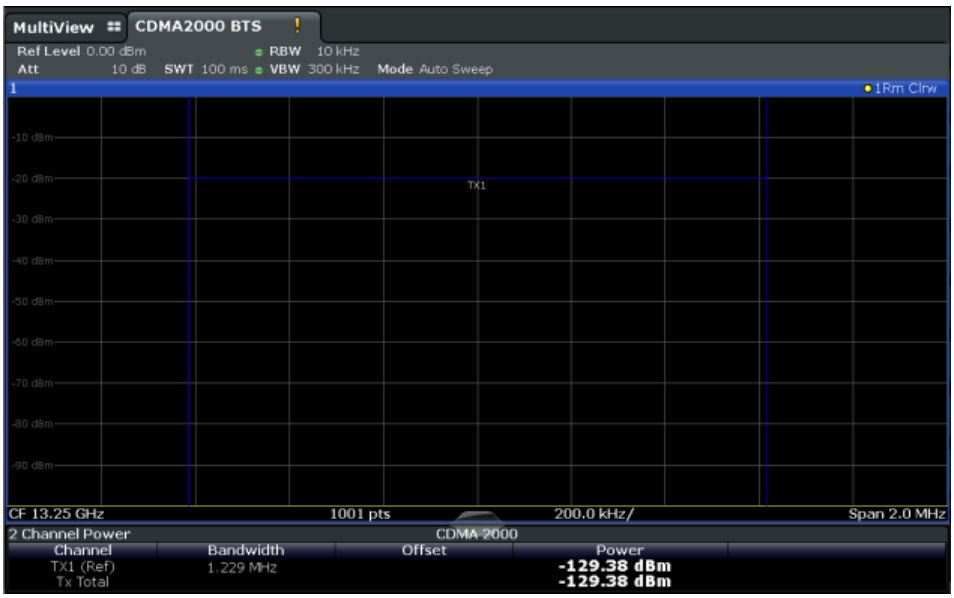
3.2.1 RF Measurement Types and Results

The CDMA2000 applications provide the following RF measurements:

Power....28
Channel Power ACLR....29
Spectrum Emission Mask....30
Occupied Bandwidth....31
CCDF....32

Power
The Power measurement determines the CDMA2000 signal channel power.

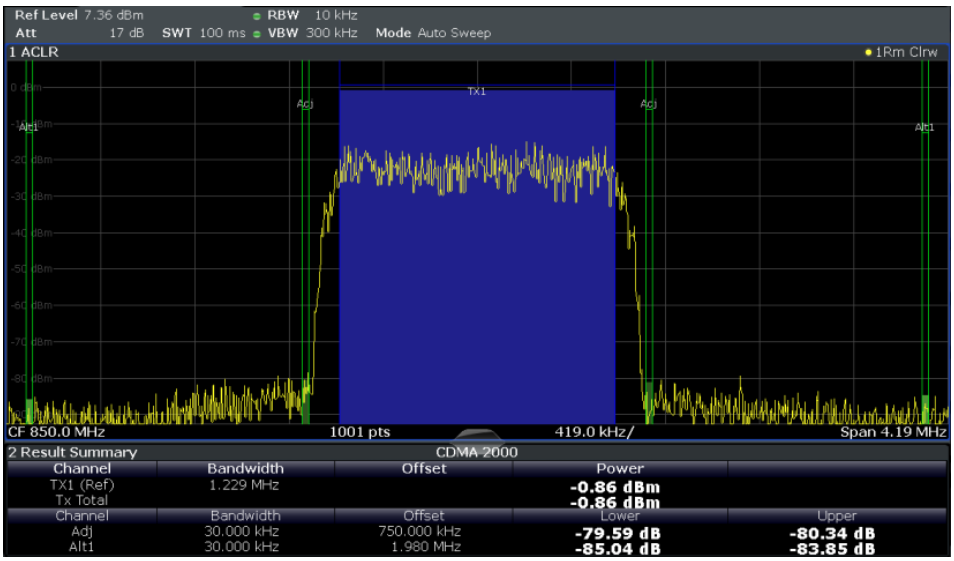
To do so, the CDMA2000 application performs a Channel Power measurement as in the Spectrum application with settings according to the CDMA2000 standard. The bandwidth and the associated channel power are displayed in the Result Summary.



Remote command:
`CONF:CDP:MEAS POW`, see `CONFigure:CDPower[:BTS]:MEASurement` on page 142
Querying results: `CALC:MARK:FUNC:POW:RES? CPOW`, see `CALCulate:MARKer:FUNCtion:POWer:RESult?` on page 234
`CALC:MARK:FUNC:POW:RES? ACP`, see `CALCulate:MARKer:FUNCtion:POWer:RESult?` on page 234

Channel Power ACLR
Channel Power ACLR performs an adjacent channel power measurement in the default setting according to CDMA2000 specifications (adjacent channel leakage ratio).

The R&S FSW measures the channel power and the relative power of the adjacent channels and of the alternate channels. The results are displayed in the Result Summary.



Remote command:

`CONF:CDP:MEAS ACLR`, see `CONFigure:CDPower[:BTS]:MEASurement` on page 142

Querying results:

`CALC:MARK:FUNC:POW:RES? ACP`, see `CALCulate:MARKer:FUNCtion:POWer:RESult?` on page 234

`CALC:MARK:FUNC:POW:RES? ACP`, see `CALCulate:MARKer:FUNCtion:POWer:RESult?` on page 234

Spectrum Emission Mask

The Spectrum Emission Mask measurement determines the power of the CDMA2000 signal in defined offsets from the carrier and compares the power values with a spectral mask specified by the CDMA2000 specifications. The limits depend on the selected bandclass.Thus, the performance of the DUT can be tested and the emissions and their distance to the limit be identified.

Note: The CDMA2000 standard does not distinguish between spurious and spectral emissions.

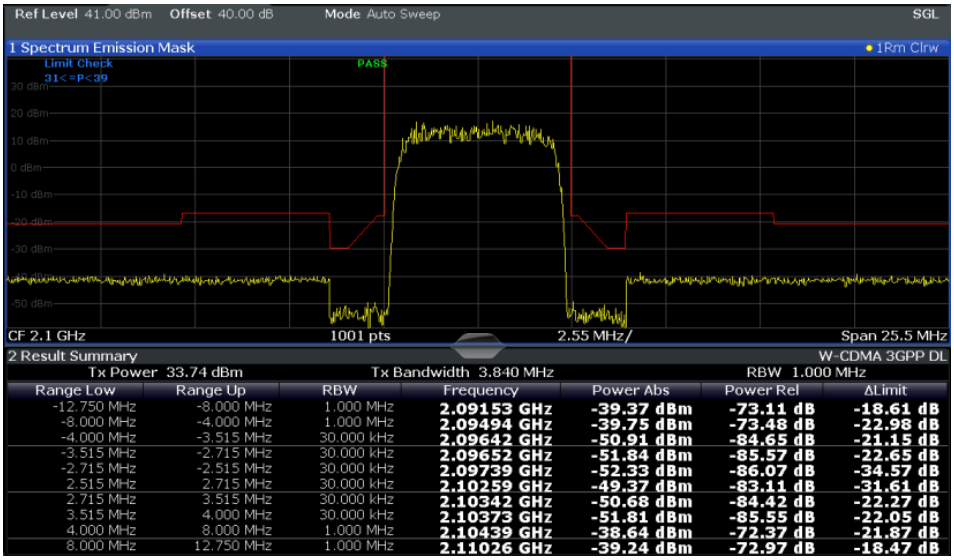
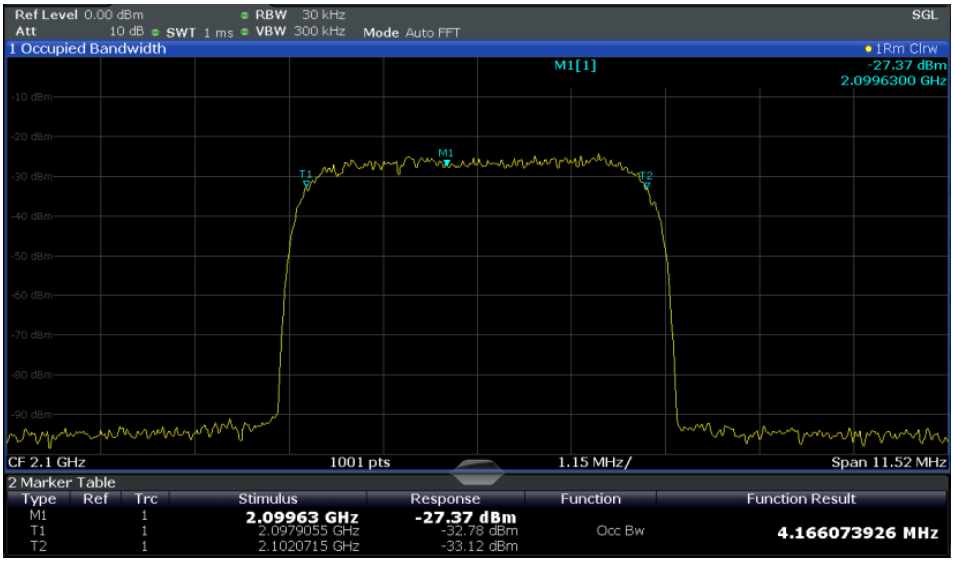

Ref Level 41.00 dBm Offset 40.00 dB Mode Auto Sweep SGL
1 Spectrum Emission Mask 1Rm Clrw
Limit Check PASS
31<=P<39
CF 2.1 GHz 1001 pts 2.55 MHz/ Span 25.5 MHz
2 Result Summary W-CDMA 3GPP DL
Tx Power 33.74 dBm Tx Bandwidth 3.840 MHz RBW 1.000 MHz
Range Low | Range Up | RBW | Frequency | Power Abs | Power Rel | ΔLimit
-12.750 MHz | -8.000 MHz | 1.000 MHz | 2.09153 GHz | -39.37 dBm | -73.11 dB | -18.61 dB
-8.000 MHz | -4.000 MHz | 1.000 MHz | 2.09494 GHz | -39.75 dBm | -73.48 dB | -22.98 dB
-4.000 MHz | -3.515 MHz | 30.000 kHz | 2.09642 GHz | -50.91 dBm | -84.65 dB | -21.15 dB
-3.515 MHz | -2.715 MHz | 30.000 kHz | 2.09652 GHz | -51.84 dBm | -85.57 dB | -22.65 dB
-2.715 MHz | -2.515 MHz | 30.000 kHz | 2.09739 GHz | -52.33 dBm | -86.07 dB | -34.57 dB
2.515 MHz | 2.715 MHz | 30.000 kHz | 2.10259 GHz | -49.37 dBm | -83.11 dB | -31.61 dB
2.715 MHz | 3.515 MHz | 30.000 kHz | 2.10342 GHz | -50.68 dBm | -84.42 dB | -22.27 dB
3.515 MHz | 4.000 MHz | 30.000 kHz | 2.10373 GHz | -51.81 dBm | -85.55 dB | -22.05 dB
4.000 MHz | 8.000 MHz | 1.000 MHz | 2.10439 GHz | -38.64 dBm | -72.37 dB | -21.87 dB
8.000 MHz | 12.750 MHz | 1.000 MHz | 2.11026 GHz | -39.24 dBm | -72.97 dB | -18.47 dB

Fig. 3-13: SEM measurement results for the BTS application

Remote command:
`CONF:CDP:MEAS ESP`, see `CONFigure:CDPower[:BTS]:MEASurement` on page 142
Querying results:
`CALC:MARK:FUNC:POW:RES? CPOW`, see `CALCulate:MARKer:FUNCtion:POWer:RESult?` on page 234
`CALC:MARK:FUNC:POW:RES? ACP`, see `CALCulate:MARKer:FUNCtion:POWer:RESult?` on page 234
`CALCulate:LIMit<k>:FAIL` on page 233

Occupied Bandwidth
The Occupied Bandwidth measurement determines the bandwidth in which – in default settings - 99 % of the total signal power is to be found. The percentage of the signal power to be included in the bandwidth measurement can be changed.

The occupied bandwidth (Occ BW) and the frequency markers are displayed in the marker table.



Remote command:
`CONF:CDP:MEAS OBAN`, see `CONFigure:CDPower[:BTS]:MEASurement` on page 142
Querying results:
`CALC:MARK:FUNC:POW:RES? OBW`, see `CALCulate:MARKer:FUNCtion:POWer:RESult?` on page 234
`CALC:MARK:FUNC:POW:RES? ACP`, see `CALCulate:MARKer:FUNCtion:POWer:RESult?` on page 234

CCDF
The CCDF measurement determines the distribution of the signal amplitudes (complementary cumulative distribution function). The CCDF and the Crest factor are displayed. For the purposes of this measurement, a signal section of user-definable length is recorded continuously in the zero span, and the distribution of the signal amplitudes is evaluated.

Fig. 3-14: CCDF measurement results for the BTS application

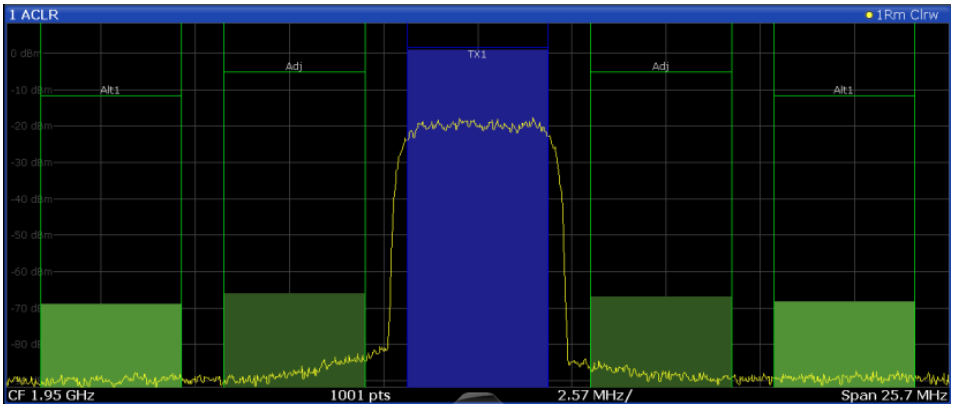
Remote command:
`CONF:CDP:MEAS CCDF`, see `CONFigure:CDPower[:BTS]:MEASurement` on page 142
Querying results:
`CALCulate<n>:MARKer<m>:Y?` on page 217
`CALC:MARK:FUNC:POW:RES? ACP`, see `CALCulate:MARKer:FUNCtion:POWer:RESult?` on page 234
`CALC:MARK:FUNC:POW:RES? ACP`, see `CALCulate:MARKer:FUNCtion:POWer:RESult?` on page 234
`CALCulate:STATistics:RESult<t>?` on page 236

3.2.2 Evaluation Methods for RF Measurements

The evaluation methods for RF measurements are identical to those in the Spectrum application.

Diagram....33
Result Summary....34
Marker Table....34
Marker Peak List....34

Diagram
Displays a basic level vs. frequency or level vs. time diagram of the measured data to evaluate the results graphically. This is the default evaluation method. Which data is displayed in the diagram depends on the "Trace" settings. Scaling for the y-axis can be configured.



Remote command:
`LAY:ADD? '1',RIGH, DIAG`, see `LAYout:ADD[:WINDow]?` on page 201

Result Summary
Result summaries provide the results of specific measurement functions in a table for numerical evaluation. The contents of the result summary vary depending on the selected measurement function. See the description of the individual measurement functions for details.

2 Result Summary

Channel	Bandwidth	Offset	Power	
TX1 (Ref)	1.229 MHz		-0.86 dBm	
Tx Total			-0.86 dBm	
Channel	**Bandwidth**	**Offset**	**Lower**	**Upper**
Adj	30.000 kHz	750.000 kHz	-79.59 dB	-80.34 dB
Alt1	30.000 kHz	1.980 MHz	-85.04 dB	-83.85 dB

Remote command:
`LAY:ADD? '1',RIGH, RSUM`, see `LAYout:ADD[:WINDow]?` on page 201

Marker Table
Displays a table with the current marker values for the active markers.

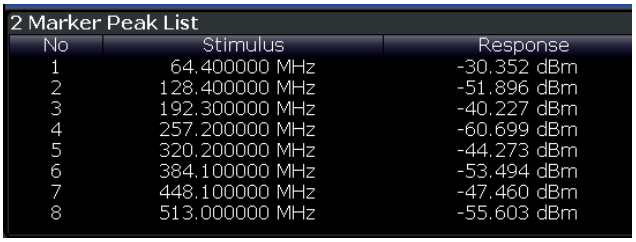
This table may be displayed automatically if configured accordingly (see "Marker Table Display" on page 115).

2 Marker

Type	Ref	Trc	Stimulus	Response	Function	Function Result
N1		1	13.197 GHz	-25.87 dBm	Count	13.19705
D1	N1	1	-7.942 GHz	-49.41 dB		
D2	N1	2	-3.918 GHz	-21.90 dB		
D3	N1	3	4.024 GHz	-21.99 dB		

Remote command:
`LAY:ADD? '1',RIGH, MTAB`, see `LAYout:ADD[:WINDow]?` on page 201
Results:
`CALCulate<n>:MARKer<m>:X` on page 239
`CALCulate<n>:MARKer<m>:Y?` on page 217

Marker Peak List
The marker peak list determines the frequencies and levels of peaks in the spectrum or time domain. How many peaks are displayed can be defined, as well as the sort order. In addition, the detected peaks can be indicated in the diagram. The peak list can also be exported to a file for analysis in an external application.


2 Marker Peak List

No	Stimulus	Response
1	64.400000 MHz	-30.352 dBm
2	128.400000 MHz	-51.896 dBm
3	192.300000 MHz	-40.227 dBm
4	257.200000 MHz	-60.699 dBm
5	320.200000 MHz	-44.273 dBm
6	384.100000 MHz	-53.494 dBm
7	448.100000 MHz	-47.460 dBm
8	513.000000 MHz	-55.603 dBm

Remote command:

`LAY:ADD? '1',RIGH, PEAK`, see `LAYout:ADD[:WINDow]?` on page 201

Results:

`CALCulate<n>:MARKer<m>:X` on page 239

`CALCulate<n>:MARKer<m>:Y?` on page 217

4 Measurement Basics

CDMA2000® is based on code division multiplex access (CDMA), where all users share the same 1.25 MHz-wide channel, but use individual pseudo noise (PN) sequences for differentiation.

CDMA2000® was specified by 3GPP2 (3rd Generation Partnership Project 2). The following link provides access to 3GPP2 specifications:

http://www.3gpp2.org/Public_html/specs/index.cfm

Some background knowledge on basic terms and principles used in CDMA2000 tests and measurements is provided here for a better understanding of the required configuration settings.

- PCGs and Sets....36
- Channels, Codes and Symbols....36
- Code Display and Sort Order....38
- Scrambling via PN Offsets and Long Codes....40
- Code Mapping and Branches....40
- Radio Configuration....41
- Transmission with Multiple Carriers and Multiple Antennas....41
- Channel Detection and Channel Types....43
- Test Setup for CDMA2000 Tests....45
- CDA Measurements in MSRA Operating Mode....47

4.1 PCGs and Sets

The user data is transmitted in individual data packages, each of which may have different transmission settings such as the power level. The data in one such package, for which the power remains constant, is called a power control group, or **PCG**. A PCG has a duration of 1.25 ms (or 1536 chips, same as slots in other standards).

The CDMA2000 applications can capture up to 31360 PCGs (about 26 seconds) in a single sweep. In order to improve performance during measurement and analysis, the captured PCGs are not processed by the CDMA2000 application all at once, but rather in **sets**, one at a time. One set consists of 64 PCGs. You can select how many sets are to be captured and which set is currently analyzed and displayed. The possible value range is from 1 to a maximum of 490 sets.

4.2 Channels, Codes and Symbols

In CDMA2000 applications, the data is transmitted in **channels**. These channels are based on orthogonal **codes** and can have different **symbol rates**. The symbol rate depends on the used modulation type and the spreading factor of the channel.

Spreading factors

Spreading factors determine whether the transmitted data is sent in short or long sequences. The spreading factor is re-assigned dynamically in certain time intervals according to the current demand of users and data to be transmitted. The higher the spreading factor, the lower the data rate; the lower the spreading factor, the higher the data rate.

A channel with a lower spreading factor consists of several combined codes. That means a channel can be described by its number and its spreading factor.

The spread bits are called **chips**.

Since a PCG is a fixed time unit, knowing the symbol rate you can calculate how many symbols are transmitted for each PCG.

For evaluations which display symbols on the x–axis, the maximum number of symbols varies according to the symbol rate of the selected code channel. With transmit diversity signals, the symbols of the signal are distrubuted on two antennas (see chapter 4.7.2, "Antenna Diversity", on page 42). Therefore the symbol number is reduced to half.

The following table shows the relationship between the code class, the spreading factor, the number of codes per channel, and the symbol rate.

Table 4-1: Relationship between various code parameters for CDMA2000 BTS signals

Code class	Spreading factor	No. codes / channel	Symbol rate [ksps]	Symbols per PCG (no transmit diversity)	Symbols per PCG (transmit diversity)
2	4	128	307.2	384	192
3	8	64	153.6	192	96
4	16	32	76.8	96	48
5	32	16	38.4	48	24
6	64	8	19.2	24	12
7	128	4	9.6	12	6

Table 4-2: Relationship between various code parameters for CDMA2000 MS signals

Code class	Spreading factor	No. codes / channel	Symbol rate [ksps]	Symbols per PCG
1	2	128	614.4	768
2	4	64	307.2	384
3	8	32	153.6	192
4	16	16	76.8	96
5	32	8	38.4	48
6	64	4	19.2	24

Number of bits per symbol

Depending on the modulation type, a symbol consists of the following number of bits:

- **BPSK**: 1 bit (for BTS signals, only the I-component is assigned)
- **QPSK**: 2 bits (I-component followed by the Q-component)
- **8PSK**: 3 bits
- **16QAM**: 4 bits

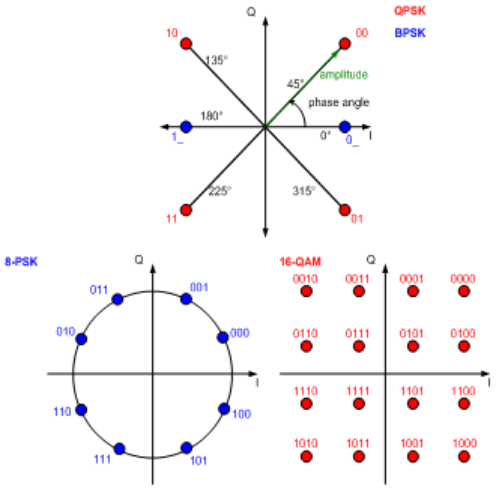


Fig. 4-1: Bits per symbol constellations for different modulation types in the BTS application

4.3 Code Display and Sort Order

In the result displays that refer to codes, the currently selected code is highlighted in the diagram. You select a code by entering a code number in the "Evaluation Range" settings.

By default, codes are displayed in ascending order of the code number (**Hadamard** order). The currently selected code number is highlighted. If the code belongs to a detected active channel, the entire channel is highlighted. (For details on active channels and channel detection see chapter 4.8, "Channel Detection and Channel Types", on page 43.)

However, in CDMA2000 signals, the codes that belong to the same channel need not lie next to each other in the code domain, they may be distributed.

Example: Example for Hadamard order

For a base spreading factor of 64, the following code order is displayed:

0.64, 1.64, 2.64, …, 63.64.

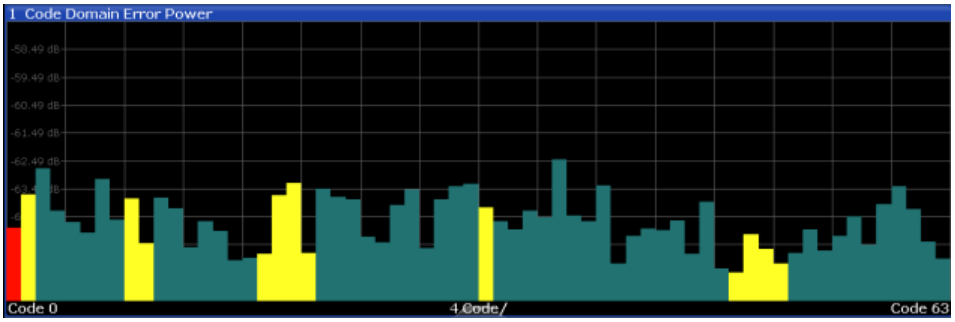


Fig. 4-2: Code Domain Error Power result display in Hadamard code sorting order

In order to compare all codes in the same channel visually, a **Bit-Reverse** sorting order is provided. In this case, all codes of a channel are displayed next to each other.

Example: Example for Bit-Reverse order

For a base spreading factor of 64, the following code order may be displayed:

0.64, 32.64, 16.64, 48.64, 8.64, 40.64, …, 15.64, 47.64,31.64, 63.64

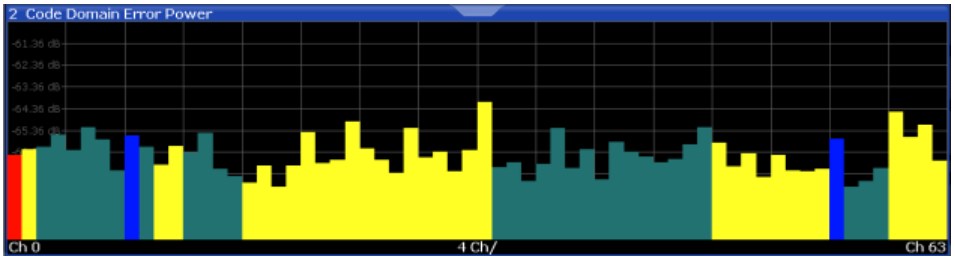


Fig. 4-3: Code Domain Error Power result display in BitReverse code sorting order

For the display in the CDMA2000 BTS application, the scale for code-based diagrams displays 64 codes by default (32 in the MS application). However, you can change the **base spreading factor** for the display, and thus the number of displayed codes.

Alias power

Note, however, that if you select a base spreading factor that is lower than the actual spreading factor used by the channel (e.g. 64 for channels with a base spreading factor of 128), the results are distorted. This is due to the fact that a wider area of the code domain is taken into consideration, for example when calculating the power level, than the code actually occupies. The excess power calculated due to a false spreading factor is referred to as **alias power**.

4.4 Scrambling via PN Offsets and Long Codes

Short code scrambling

Base stations use a pseudo noise (PN) sequence (also referred to as short code sequence) to scramble the data during transmission. The used PN sequence is circulated in fixed time intervals. A specified **PN offset** value determines the start phase for the short code sequence.

The PN parameter is unique for each base station. Thus, the signals from different base stations can be distinguished quickly by the CDMA2000 BTS application if the "PN Offset" is defined in the signal description and an external trigger is used to provide a reference for the start phase. If no offset is specified or no external trigger is available, calculation is much slower as the correct PN must be determined from all possible positions.

During short code scrambling, the channel data is split up into I and Q components.

Long code scrambling

Mobile stations also use a PN short code, but with a fixed or no offset. Additionally, a complex **long code** is used for scrambling, making the data less susceptible to interference. The long code used by a mobile station is defined by a mask and an offset. These settings are required by the CDMA2000 MS application to distinguish the senders and are defined in the signal description.

The long code offset also includes the PN offset (if any) and is defined in chips. The offset corresponds to the GPS timing since 6.1.1980 00:00:00 UTC. The offset in chips is calculated as follows:

```
tSinceStartGPS  * 1.2288 MChips/s
```

where `tSinceStartGPS` is defined in seconds

The offset is applied at the next trigger pulse, which cannot occur until a setup time of 300 ms has elapsed.

A special **long code generation mode** is provided to analyze signals sent by an Agilent ESG 101 generator.

During long code scrambling, the channel data is mapped either to the I or to the Q branch of the complex input signal.

4.5 Code Mapping and Branches

Since MS signals use long code scrambling, the channel data is mapped either to the I or to the Q branch of the complex input signal. During channel detection, the branch to which the data was mapped is determined and indicated in the channel table. During analysis, each branch of the symbol constellation area (imaginary part, I, or real part, Q) can be evaluated independantly. Thus, when analyzing MS signals, you must define which branch results you want to analyze. Especially for code power measurements the

results may vary considerably. While a channel may be active on one branch, the other branch may belong to an inactive channel.

4.6 Radio Configuration

The radio configuration specifies various settings for transmission according to the CDMA2000 standard including:

- allowed data rates
- modulation types
- use of special channels
- transmit diversity

The standard describes nine RCs for BTS and six for MS signals, for different transmission scenarios.

In the BTS application, the radio configuration can be customized for two channel types: PDCH and CHAN (see chapter 4.8.1, "BTS Channel Types", on page 43). The applied RC is specified for each channel of these types in the channel tables. Predefined channel tables are provided for particular radio configurations (see chapter A.1, "Reference: Predefined Channel Tables", on page 253).

The following RCs are used in the BTS application:

Table 4-3: RCs used in the BTS application:

Channel type	Modulation	Manual operation	SCPI parameter
PDCH	QPSK	10	10
	8PSK	10	20
	16QAM	10	30
CHAN		1-2	1
		3-5	3
special channels		-	0

4.7 Transmission with Multiple Carriers and Multiple Antennas

The CDMA2000 standard allows for transmission using multiple carriers as well as transmission via multiple antennas.

4.7.1 Multi-Carrier Mode

The CDMA2000 applications can filter out and analyze one carrier out of a multi-carrier signal, if a special multi-carrier mode is activated in the signal description.

Two filter types used to select the required carrier from the signal are available for selection: a low-pass filter and an RRC filter.

By default, the low-pass filter is active. The low-pass filter affects the quality of the measured signal compared to a measurement without a filter. The frequency response of the low-pass filter is shown below.

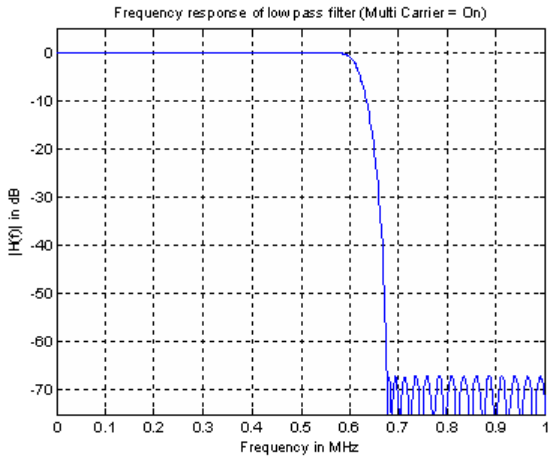


Fig. 4-4: Frequency response of the low-pass multi-carrier filter

The RRC filter comes with an integrated Hamming window. The roll-off factor of the RRC filter defines the slope of the filter curve and therefore the excess bandwidth of the filter. The cut-off frequency of the RRC filter is the frequency at which the passband of the filter begins. Both parameters can be configured.

4.7.2 Antenna Diversity

The standard allows for transmission via multiple antennas (**transmit diversity**). If transmit diversity is implemented for the input signal, the CDMA2000 BTS application must know which antenna to analyze the input from. This information is provided by the signal description (**"Antenna Diversity"**). Depending on which antenna is selected for analysis, certain special channels are required for predefined channel tables (see also "Channel table definition for transmit diversity" on page 44):

Antenna	Required special channels
1	Pilot channel (F-PICH, 0.64) required and used as power reference Transmit diversity pilot channel (F-TDPICH, 16.128) not allowed
2	Transmit diversity pilot channel (F-TDPICH, 16.128) required and used as power reference Pilot channel (F-PICH, 0.64) not allowed
- (No diversity)	Pilot channel (F-PICH, 0.64) required and used as power reference Transmit diversity pilot channel (F-TDPICH, 16.128) required

4.8 Channel Detection and Channel Types

The CDMA2000 applications provide two basic methods of detecting active channels:

- **Automatic search using pilot sequences**
  The application performs an automatic search for active (DPCH) channels throughout the entire code domain. At the specific codes at which channels can be expected, the application detects an active channel if the corresponding symbol rate and a sufficiently high power level is measured (see "Inactive Channel Threshold" on page 90).
  Any channel that does not have a predefined channel number and symbol rate is considered to be a data channel.
  In the MS application, a channel is considered to be active if a minimum signal/noise ratio is maintained within the channel.
- **Comparison with predefined channel tables**
  The input signal is compared to a predefined channel table. All channels that are included in the predefined channel table are considered to be active.
  For a list of predefined channel tables provided by the CDMA2000 applications see chapter A.1, "Reference: Predefined Channel Tables", on page 253.

Quasi-inactive channels in the MS application

In the MS application, only one branch in the code domain is analyzed at a time (see also chapter 4.5, "Code Mapping and Branches", on page 40). However, even if the code on the analyzed branch is inactive, the code with the same number on the other branch may belong to an active channel. In this case, the channel is indicated as **quasi-inactive** in the current branch evaluation.

4.8.1 BTS Channel Types

The CDMA2000 standard defines various BTS channel types. Some special channels are mandatory and must be contained in the signal, as they have control or synchronization functions. Thus, these channels always occupy a specific channel number and use a specific symbol rate by which they can be identified.

Special channels

The CDMA2000 BTS application expects at least the Pilot Channel (F-PICH) or the Transmit Diversity Pilot CHannel (F-TDPICH) for the Code Domain Power measurements.

The following channels are detected automatically during automatic channel detection:

Table 4-4: Common CDMA2000 BTS channels and their usage

Channel type	Ch.no. / SF	Modulation	Description
F-PICH	0.64	BPSK	Pilot channel
F-PCH	1.64	BPSK	Paging channel

Channel type	Ch.no. / SF	Modulation	Description
F-TDPICH	16.128	BPSK	Transmit Diversity Pilot CHannel
F-SYNC	32.64	BPSK	Synchronization channel
F-CHAN		BPSK (RC 1+2) QPSK (RC 3-5)	active data channel
INACTIVE		-	inactive channel
F-PDCCH		QPSK	Packet Data Control CHannel
F-PDCH	.32	QPSK, 8PSK, or 16-QAM	Packet Data CHannel

In addition, the following channel types can be defined in a predefined channel table for the CDMA2000 BTS application.

Channel type	Ch.no. / SF	Description
F-APICH	BPSK	Auxiliary Pilot CHannel
F-ATDPICH	BPSK	Auxiliary Ttransmit Diversity Pilot CHannel
F-BCH	QPSK	Broadcast CHannel
F-CACH	QPSK	Common Assignment Channel
F-CCCH	QPSK	Common Control CHannel
F-CPCCH	QPSK	Common Power Control CHannel

Channel table definition for transmit diversity

In a measurement scenario with two antennas (transmit diversity), the following conditions apply to the channel table definition:

- **Antenna 1** is used for transmission:
  - The pilot channel **F-PICH must** be included.
  - The pilot channel of antenna 2 **F-TDPICH must not** be included.
- **Antenna 2** is used for transmission:
  - The pilot channel of antenna 2 **F-TDPICH must** be included.
  - The pilot channel **F-PICH must not** be included.
- **Both antennas** are used for transmission:
  - The pilot channel **F-PICH must** be included.
  - The pilot channel of antenna 2 **F-TDPICH must** be included.

4.8.2 MS Channel Types

The following channel types can be detected in CDMA2000 MS signals by the CDMA2000 MS application.

Channel type	Ch.no / SF	Mapping	Description
ACKCH	16.64	Q	Reverse Acknowledgment Channel (1xEV-DV)
CCCH	2.8	Q	Reverse Common Control Channel
CQICH	12.16	I (if FCH availa-ble) /Q	Reverse Channel Quality Indicator Channel (1xEV-DV)
DCCH	8.16	I	Reverse Dedicated Control Channel
EACH	2.8	Q	Enhanced Access Channel
FCH	4.16	Q	Reverse Fundamental Channel
PICH	0.32	I	Reverse Pilot Channel
S1CH	1.2 or 2.4	Q	Reverse Supplemental 1 Channel
S2CH	2.4 or 6.8	I	Reverse Supplemental 2 Channel
Note: Since the EACH has the same mapping, the same channel number and the same spreading factor as the CCCH, it is not possible to distinguish them during an automatic search. In this case, both the EACH and CCCH are output.			

4.9 Test Setup for CDMA2000 Tests

Before a CDMA measurement can be performed, the R&S FSW must be set up in a test environment. This section describes the required settings of the R&S FSW if it is used as a CDMA2000 base or mobile station tester. Before starting the measurements, the R&S FSW has to be configured correctly and supplied with power as described in the R&S FSW Getting Started manual, "Preparing For Use". Furthermore, the application firmware CDMA2000 BTS or CDMA2000 MS must be enabled. Installation and enabling of the application firmware are described in the R&S FSW Getting Started manual or in the Release Notes.

NOTICE

Risk of instrument damage during operation

An unsuitable operating site or test setup can cause damage to the instrument and to connected devices. Ensure the following operating conditions before you switch on the instrument:

- All fan openings are unobstructed and the airflow perforations are unimpeded. The minimum distance from the wall is 10 cm.
- The instrument is dry and shows no sign of condensation.
- The instrument is positioned as described in the following sections.
- The ambient temperature does not exceed the range specified in the data sheet.
- Signal levels at the input connectors are all within the specified ranges.
- Signal outputs are correctly connected and are not overloaded.

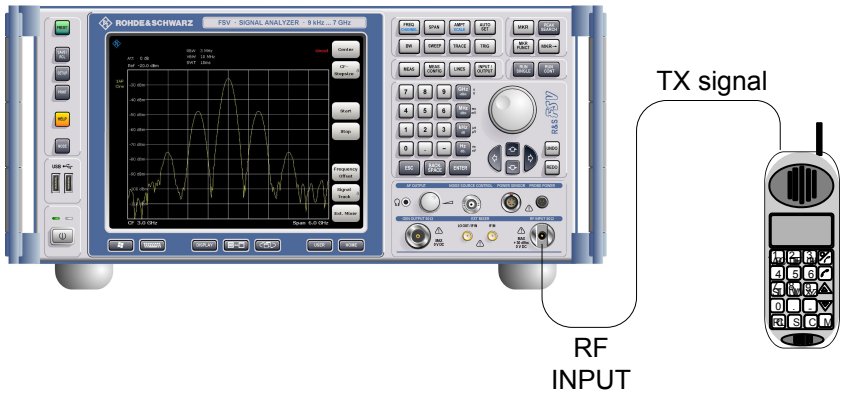
Required units and accessories

The measurements are performed with the following units and accessories:

- An R&S FSW equipped with the CDMA2000 BTS or MS option.
- R&S SMU signal generator equipped with option SMU-B9/B10/B11 baseband generator and SMUK46 CDMA2000 incl. 1xEVDV.
- 1 coaxial cable, 50 Ω, approximately 1 m, N connector
- 2 coaxial cables, 50 Ω, approximately 1 m, BNC connector

General Test Setup

Connect the antenna output (or TX output) of the base station/mobile station to the RF input of the R&S FSW. Use a power attenuator exhibiting suitable attenuation.



The following values for external attenuation are recommended to ensure that the RF input of the R&S FSW is protected and the sensitivity of the unit is not reduced too much:

Maximum Power	Recommended external attenuation
≥ 55 to 60 dBm	35 to 40 dB
≥ 50 to 55 dBm	30 to 35 dB
≥ 45 to 50 dBm	25 to 30 dB
≥ 40 to 45 dBm	20 to 25 dB
≥ 35 to 40 dBm	15 to 20 dB
≥ 30 to 35 dBm	10 to 15 dB
≥ 25 to 30 dBm	0 to 10 dB
≥ 20 to 25 dBm	0 to 5 dB
≤ 20 dBm	0 dB

- For signal measurements at the output of two-port networks, connect the reference frequency of the signal source to the rear reference input (REF INPUT) of the R&S FSW.
- The R&S FSW must be operated with an external frequency reference to ensure that the error limits of the CDMA2000 specification for frequency measurements on base stations/mobile stations are met. A rubidium frequency standard can be used as a reference source, for example.
- If the device under test (DUT) has a trigger output, connect the trigger output of the DUT to one of the trigger inputs (TRIGGER INPUT) of the R&S FSW (see "Trigger 2/3" on page 70).

Presettings

(For details see chapter 6.2, "Code Domain Analysis", on page 53)

- Enter the external attenuation.
- Enter the reference level.
- Enter the center frequency.
- Set the trigger.
- If used, enable the external reference.
- Select the CDMA2000 standard and the desired measurement.
- Set the PN offset.

4.10 CDA Measurements in MSRA Operating Mode

The CDMA2000 BTS application can also be used to analyze data in MSRA operating mode.

In MSRA operating mode, only the MSRA Master actually captures data; the MSRA applications receive an extract of the captured data for analysis, referred to as the **application data**. For the CDMA2000 BTS application in MSRA operating mode, the appli-

cation data range is defined by the same settings used to define the signal capture in Signal and Spectrum Analyzer mode. In addition, a capture offset can be defined, i.e. an offset from the start of the captured data to the start of the analysis interval for the CDMA2000 BTS measurement.

Data coverage for each active application

Generally, if a signal contains multiple data channels for multiple standards, separate applications are used to analyze each data channel. Thus, it is of interest to know which application is analyzing which data channel. The MSRA Master display indicates the data covered by each application, restricted to the channel bandwidth used by the corresponding standard (for CDMA2000: 1.2288 MHz), by vertical blue lines labeled with the application name.

Analysis interval

However, the individual result displays of the application need not analyze the complete data range. The data range that is actually analyzed by the individual result display is referred to as the **analysis interval**.

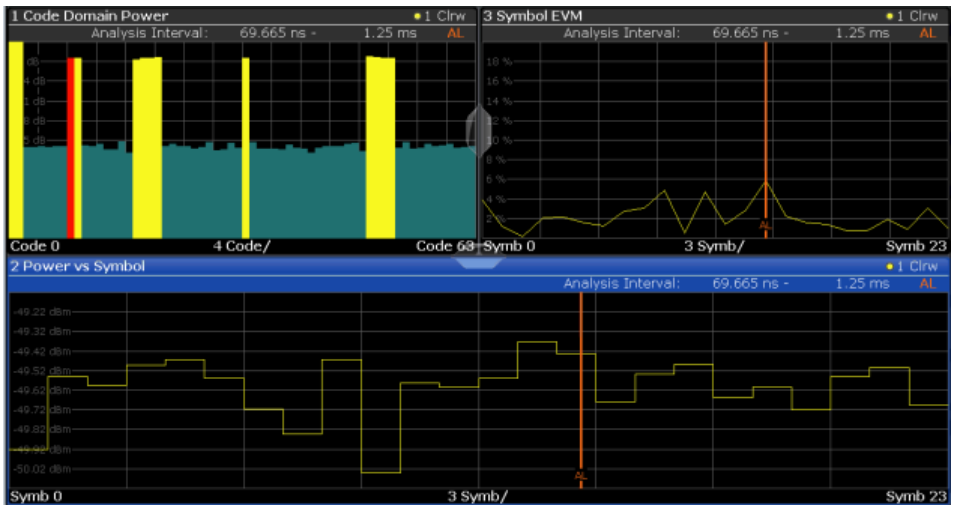
In the CDMA2000 BTS application the analysis interval is automatically determined according to the selected set, PCG or code to analyze which is defined for the evaluation range, depending on the result display. The analysis interval can not be edited directly in the CDMA2000 BTS application, but is changed automatically when you change the evaluation range.

Analysis line

A frequent question when analyzing multi-standard radio signals is how each data channel is correlated (in time) to others. Thus, an analysis line has been introduced in firmware version 1.60. The analysis line is a common time marker for all MSRA applications. It can be positioned in any MSRA application or the MSRA Master and is then adjusted in all other applications. Thus, you can easily analyze the results at a specific time in the measurement in all applications and determine correlations.

If the marked point in time is contained in the analysis interval of the application, the line is indicated in all time-based result displays, such as time, symbol, slot or bit diagrams. By default, the analysis line is displayed, however, it can be hidden from view manually. In all result displays, the "AL" label in the window title bar indicates whether or not the analysis line lies within the analysis interval or not:

- **orange "AL"**: the line lies within the interval
- **white "AL"**: the line lies within the interval, but is not displayed (hidden)
- **no "AL"**: the line lies outside the interval



For details on the MSRA operating mode see the R&S FSW MSRA User Manual.

5 I/Q Data Import and Export

Baseband signals mostly occur as so-called complex baseband signals, i.e. a signal representation that consists of two channels; the in phase (I) and the quadrature (Q) channel. Such signals are referred to as I/Q signals. I/Q signals are useful because the specific RF or IF frequencies are not needed. The complete modulation information and even distortion that originates from the RF, IF or baseband domains can be analyzed in the I/Q baseband.

Importing and exporting I/Q signals is useful for various applications:

- Generating and saving I/Q signals in an RF or baseband signal generator or in external software tools to analyze them with the R&S FSW later
- Capturing and saving I/Q signals with an RF or baseband signal analyzer to analyze them with the R&S FSW or an external software tool later

As opposed to storing trace data, which may be averaged or restricted to peak values, I/Q data is stored as it was captured, without further processing. The data is stored as complex values in 32-bit floating-point format. Multi-channel data is not supported. The I/Q data is stored in a format with the file extension `.iq.tar`. For a detailed description see chapter A.4, "Reference: I/Q Data File Format (iq-tar)", on page 260.

- Import/Export Functions.....50

5.1 Import/Export Functions

The following import and export functions are available via softkeys in the "Save/Recall" menu which is displayed when you select the "Save" or "Open" icon in the toolbar.

Some functions for particular data types are (also) available via softkeys or dialog boxes in the corresponding menus, e.g. trace data or marker peak lists.

For a description of the other functions in the "Save/Recall" menu see the R&S FSW User Manual.

Export.....50
└ IQ Export.....50
Import.....51
└ IQ Import.....51

Export
Opens a submenu to configure data export.

IQ Export ← Export
Opens a file selection dialog box to select an export file to which the IQ data will be stored. This function is only available in single sweep mode, and only in applications that process I/Q data, such as the I/Q Analyzer or optional applications.

For details see chapter 5, "I/Q Data Import and Export", on page 50.

Remote command:
`MMEMory:STORe:IQ:STATe` on page 246
`MMEMory:STORe:IQ:COMMent` on page 246

Import
Provides functions to import data.

IQ Import ← Import
Opens a file selection dialog box to select an import file that contains IQ data. This function is only available in single sweep mode and only in applications that process I/Q data, such as the I/Q Analyzer or optional applications.

Note that the I/Q data must have a specific format as described in chapter A.4, "Reference: I/Q Data File Format (iq-tar)", on page 260.

I/Q import is not available in MSRA mode.

For details see chapter 5, "I/Q Data Import and Export", on page 50.

Remote command:
`MMEMory:LOAD:IQ:STATe` on page 245

6 Configuration

The CDMA2000 applications provide several different measurements for signals according to the CDMA2000 standard. The main and default measurement is Code Domain Analysis. In addition to the code domain power measurements specified by the CDMA2000 standard, the CDMA2000 applications offer measurements with predefined settings in the frequency domain, e.g. RF power measurements.

Only one measurement type can be configured per channel; however, several channels for CDMA2000 applications can be configured in parallel on the R&S FSW. Thus, you can configure one channel for a Code Domain Analysis, for example, and another for a Power measurement for the same input signal. Then you can use the Sequencer to perform all measurements consecutively and switch through the results easily, or monitor all results at the same time in the "MultiView" tab.

For details on the Sequencer function see the R&S FSW User Manual.

Selecting the measurement type

When you activate a measurement channel in a CDMA2000 application, Code Domain Analysis of the input signal is started automatically. However, the CDMA2000 applications also provide other measurement types.

► To select a different measurement type, do one of the following:

- Tap the "Overview" softkey. In the "Overview", tap the "Select Measurement" button. Select the required measurement.
- Press the MEAS key on the front panel. In the "Select Measurement" dialog box, select the required measurement.

- Result Display.....52
- Code Domain Analysis.....53
- RF Measurements.....102

6.1 Result Display

The captured signal can be displayed using various evaluation methods. All evaluation methods available for CDMA2000 applications are displayed in the evaluation bar in SmartGrid mode when you do one of the following:

- Select the "SmartGrid" icon from the toolbar.
- Select the "Display" button in the "Overview".
- Press the MEAS key.
- Select the "Display Config" softkey in any CDMA2000 menu.

Up to 16 evaluation methods can be displayed simultaneously in separate windows. The CDMA2000 evaluation methods are described in chapter 3.1.2, "Evaluation Methods for Code Domain Analysis", on page 18.

To close the SmartGrid mode and restore the previous softkey menu select the "Close" icon in the righthand corner of the toolbar, or press any key on the front panel.

For details on working with the SmartGrid see the R&S FSW Getting Started manual.

6.2 Code Domain Analysis

CDMA2000 measurements require a special application on the R&S FSW, which you activate using the MODE key on the front panel.

When you activate a CDMA2000 application the first time, a set of parameters is passed on from the currently active application:

- center frequency and frequency offset
- reference level and reference level offset
- attenuation

After initial setup, the parameters for the measurement channel are stored upon exiting and restored upon re-entering the channel. Thus, you can switch between applications quickly and easily.

When you activate a CDMA2000 application, Code Domain Analysis of the input signal is started automatically with the default configuration. The "Code Domain Analyzer" menu is displayed and provides access to the most important configuration functions. This menu is also displayed when you press the MEAS CONFIG key on the front panel.

The "Span", "Bandwidth", "Lines", and "Marker Functions" menus are not available for CDA measurements.

Code Domain Analysis can be configured easily in the "Overview" dialog box, which is displayed when you select the "Overview" softkey from any menu.

Importing and Exporting I/Q Data

The I/Q data to be evaluated for CDMA2000 can not only be measured by the CDMA2000 applications themselves, it can also be imported to the applications, provided it has the correct format. Furthermore, the evaluated I/Q data from the CDMA2000 applications can be exported for further analysis in external applications.

The import and export functions are available in the "Save/Recall" menu which is displayed when you select the "Save" or "Open" icon in the toolbar.

For details on importing and exporting I/Q data see the R&S FSW User Manual.

- Default Settings for Code Domain Analysis....54
- Configuration Overview....55
- Signal Description....57
- Data Input and Output Settings....62
- Frontend Settings....73
- Trigger Settings....81
- Signal Capture (Data Acquisition)....87
- Application Data (MSRA)....88
- Channel Detection....89
- Sweep Settings....97
- Automatic Settings....99
- Zoom Functions....101

6.2.1 Default Settings for Code Domain Analysis

When you activate a CDMA2000 application the first time, a set of parameters is passed on from the currently active application:

- center frequency and frequency offset
- reference level and reference level offset
- attenuation
- signal source and digital I/Q input settings
- input coupling
- YIG filter state

After initial setup, the parameters for the measurement channel are stored upon exiting and restored upon re-entering the channel. Thus, you can switch between applications quickly and easily.

Apart from these settings, the following default settings are activated directly after a CDMA2000 application is activated, or after a Preset Channel:

The following default settings of the Code Domain Analysis are activated:

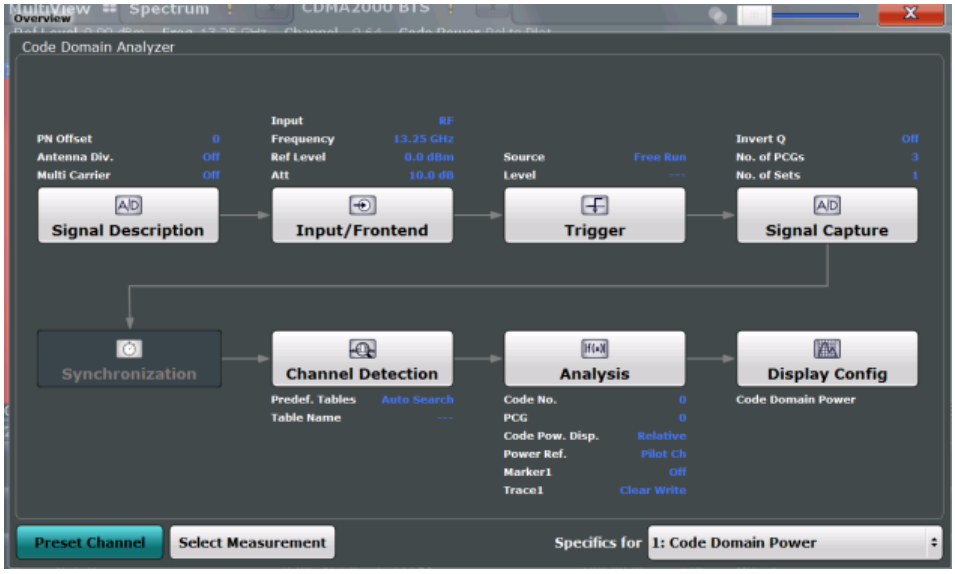
Table 6-1: Default settings for CDMA2000 channels

Parameter	Value
Common CDMA2000 settings	
Digital standard	CDMA 2000 MC1 (where MC1 stands for Multi–carrier 1 and thus describes CDMA2000 1X, i.e. a single carrier)
Measurement	Code Domain Analysis
Bandclass	BC 0: 800 MHz Cellular Band
Sweep	CONTINUOUS
Channel detection mode	AUTOSEARCH
Trigger settings	FREE RUN
Trigger offset	0

Parameter	Value
Threshold value	-60 dB
Number of PCGs	3
Number of Sets	1
PCG number	0
Code number	0
Code Order	Hadamard
Evaluations	Window 1: Code Domain Power Relative Window 2: Result Summary
BTS specific settings	
Symbol rate	19.2 ksps
PN offset	0 chips
Antenna Diversity	Off
MS specific settings	
Symbol rate	38.4 ksps
Long code mask	0
Long code offset	0
Evaluated Branch	I

6.2.2 Configuration Overview

Throughout the measurement channel configuration, an overview of the most important currently defined settings is provided in the "Overview". The "Overview" is displayed when you select the "Overview" icon, which is available at the bottom of all softkey menus.



In addition to the main measurement settings, the "Overview" provides quick access to the main settings dialog boxes. Thus, you can easily configure an entire measurement channel from input over processing to output and evaluation by stepping through the dialog boxes as indicated in the "Overview".

The available settings and functions in the "Overview" vary depending on the currently selected measurement. For RF measurements see chapter 6.3, "RF Measurements", on page 102.

For Code Domain Analysis, the "Overview" provides quick access to the following configuration dialog boxes (listed in the recommended order of processing):

1. "Select Measurement"
   See "Selecting the measurement type" on page 52
2. "Signal Description"
   See chapter 6.2.3, "Signal Description", on page 57
3. "Input/ Frontend"
   See chapter 6.2.4, "Data Input and Output Settings", on page 62 and chapter 6.2.5, "Frontend Settings", on page 73
4. (Optionally:) "Trigger"
   See chapter 6.2.6, "Trigger Settings", on page 81
5. "Signal Capture"
   See chapter 6.2.7, "Signal Capture (Data Acquisition)", on page 87

   Note: The "Synchronization" button indicated in the Overview is not required for CDMA2000 measurements.
6. "Channel Detection"
   See chapter 6.2.9, "Channel Detection", on page 89
7. "Analysis"
   See chapter 7, "Analysis", on page 107
8. "Display Configuration"
   See chapter 3.1.2, "Evaluation Methods for Code Domain Analysis", on page 18

To configure settings

► Select any button in the "Overview" to open the corresponding dialog box.
Select a setting in the channel bar (at the top of the measurement channel tab) to change a specific setting.

Preset Channel
Select the "Preset Channel" button in the lower lefthand corner of the "Overview" to restore all measurement settings **in the current channel** to their default values.

Note that the PRESET key on the front panel restores all measurements **in all measurement channels** on the R&S FSW to their default values!

See chapter 6.2.1, "Default Settings for Code Domain Analysis", on page 54 for details.

Remote command:
SYSTem:PRESet:CHANnel[:EXECute] on page 142

Select Measurement
Selects a different measurement to be performed.

See "Selecting the measurement type" on page 52.

Specifics for
The measurement channel may contain several windows for different results. Thus, the settings indicated in the "Overview" and configured in the dialog boxes vary depending on the selected window.

Select an active window from the "Specifics for" selection list that is displayed in the "Overview" and in all window-specific configuration dialog boxes.

The "Overview" and dialog boxes are updated to indicate the settings for the selected window.

6.2.3 Signal Description

The signal description provides information on the expected input signal.

- BTS Signal Description....57
- MS Signal Description....60

6.2.3.1 BTS Signal Description

These settings describe the input signal in BTS measurements.

PN Offset....58
Antenna Diversity - Antenna Number....58
Multi Carrier....59
└ Enhanced Algorithm....59
└ Multi Carrier Filter....59
└ Filter Type....59
└ Roll-Off Factor....59
└ Cut Off Frequency....60

PN Offset
Specifies the Pseudo Noise (PN) offset from an external trigger. If no offset is specified or no external trigger is available, calculation is much slower as the correct PN must be determined from all possible positions.

For details see chapter 4.4, "Scrambling via PN Offsets and Long Codes", on page 40.

Remote command:
`[SENSe:]CDPower:PNOFfset` on page 147

Antenna Diversity - Antenna Number
Activates or deactivates the orthogonal transmit diversity (two-antenna system) and defines the antenna for which the results are displayed.

For details on antenna diversity see also chapter 4.7.2, "Antenna Diversity", on page 42.

"Antenna 1" The signal of antenna 1 is fed in.

"Antenna 2" The signal of antenna 2 is fed in.

"Off" The aggregate signal from both antennas is fed in.
The pilot channels of both antennas are required.
As reference for the code power (Power Reference), PICH is used.

Remote command:
`[SENSe:]CDPower:ANTenna` on page 146

Multi Carrier
Activates or deactivates the multi-carrier mode. This mode improves the processing of multi-carrier signals. It allows you to measure one carrier out of a multi-carrier signal.

Remote command:
`CONFigure:CDPower[:BTS]:MCARrier[:STATe]` on page 146

Enhanced Algorithm ← Multi Carrier
Activates or deactivates the enhanced algorithm that is used for signal detection on multi-carrier signals. This algorithm slightly increases the calculation time.

This setting is only available if "Enhanced Algorithm" on page 59 is activated.

Remote command:
`CONFigure:CDPower[:BTS]:MCARrier:MALGo` on page 146

Multi Carrier Filter ← Multi Carrier
Activates or deactivates the usage of a filter for signal detection on multi-carrier signals.

This setting is only available if "Enhanced Algorithm" on page 59 is activated.

For details see chapter 4.7.1, "Multi-Carrier Mode", on page 41.

Remote command:
`CONFigure:CDPower[:BTS]:MCARrier:FILTer[:STATe]` on page 145

Filter Type ← Multi Carrier
Selects the filter type if Filter Type is activated.

Two filter types are available for selection: a low-pass filter and an RRC filter.

By default, the low-pass filter is active. The low-pass filter affects the quality of the measured signal compared to a measurement without a filter.

The RRC filter comes with an integrated Hamming window. If selected, two more settings become available for configuration: the Roll-Off Factor and the Cut Off Frequency.

Remote command:
`CONFigure:CDPower[:BTS]:MCARrier:FILTer:TYPE` on page 145

Roll-Off Factor ← Filter Type ← Multi Carrier
Defines the roll-off factor of the RRC filter which defines the slope of the filter curve and therefore the excess bandwidth of the filter. Possible values are between 0.01 and 0.99 in 0.01 steps. The default value is 0.02.

This parameter is available for the RRC filter.

Remote command:
`CONFigure:CDPower[:BTS]:MCARrier:FILTer:TYPE` on page 145
`CONFigure:CDPower[:BTS]:MCARrier:FILTer:ROFF` on page 144

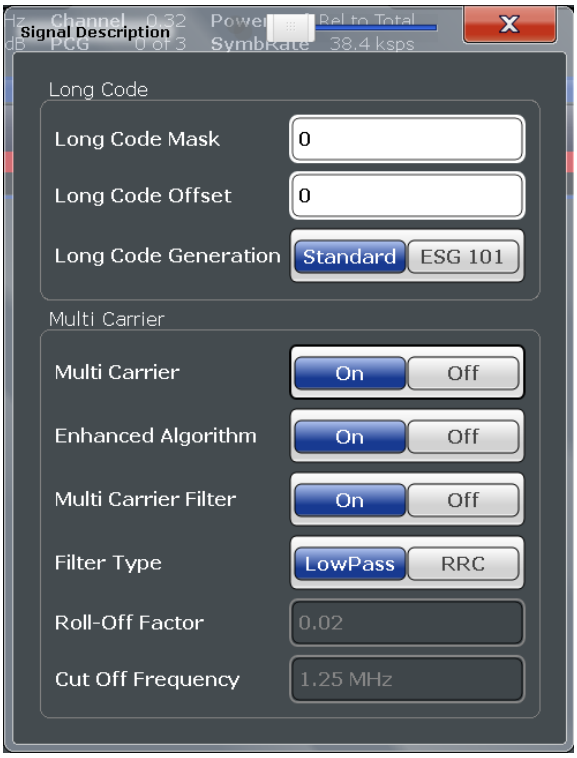
Cut Off Frequency ← Filter Type ← Multi Carrier
Defines the frequency at which the passband of the RRC filter begins. Possible values are between 0.1 MHz and 2.4 MHz in 1 Hz steps. The default value is 1.25 MHz

This parameter is available for the RRC filter.

Remote command:
`CONFigure:CDPower[:BTS]:MCARrier:FILTer:TYPE` on page 145
`CONFigure:CDPower[:BTS]:MCARrier:FILTer:COFRequency` on page 144

6.2.3.2 MS Signal Description

These settings describe the input signal in MS measurements.



Long Code Mask....60
Long Code Offset....61
Long Code Generation....61
Multi Carrier....61
└ Enhanced Algorithm....61
└ Multi Carrier Filter....61
└ Filter Type....61
└ Roll-Off Factor....62
└ Cut Off Frequency....62

Long Code Mask
Defines the long code mask of the mobile in hexadecimal form. The value range is from `0` to `4FFFFFFFFF`.

For the default mask value of `0` the Long Code Offset is not taken into consideration.

For more information on long codes see "Long code scrambling" on page 40.

Remote command:
[SENSe:]CDPower:LCODe:MASK on page 148

Long Code Offset
Defines the long code offset, including the PN offset, in chips in hexadecimal format with a 52-bit resolution. This value corresponds to the GPS timing since 6.1.1980 00:00:00 UTC. This offset is applied at the next trigger pulse (which cannot occur until a setup time of 300 ms has elapsed). The default value is 0.

The setting is ignored if the Long Code Mask is set to 0.

For more information on long codes see "Long code scrambling" on page 40.

Remote command:
[SENSe:]CDPower:LCODe:OFFSet on page 148

Long Code Generation
Selects the mode of the long code generation.

"Standard" The CDMA2000 standard long code generator is used.

"ESG 101" The Agilent ESG option 101 long code is used; in this case, only signals from that generator can be analyzed.

Remote command:
[SENSe:]CDPower:LCODe:MODE on page 148

Multi Carrier
Activates or deactivates the multi-carrier mode. This mode improves the processing of multi-carrier signals. It allows you to measure one carrier out of a multi-carrier signal.

Remote command:
CONFigure:CDPower[:BTS]:MCARrier[:STATe] on page 146

Enhanced Algorithm ← Multi Carrier
Activates or deactivates the enhanced algorithm that is used for signal detection on multi-carrier signals. This algorithm slightly increases the calculation time.

This setting is only available if "Enhanced Algorithm" on page 59 is activated.

Remote command:
CONFigure:CDPower[:BTS]:MCARrier:MALGo on page 146

Multi Carrier Filter ← Multi Carrier
Activates or deactivates the usage of a filter for signal detection on multi-carrier signals.

This setting is only available if "Enhanced Algorithm" on page 59 is activated.

For details see chapter 4.7.1, "Multi-Carrier Mode", on page 41.

Remote command:
CONFigure:CDPower[:BTS]:MCARrier:FILTer[:STATe] on page 145

Filter Type ← Multi Carrier
Selects the filter type if Filter Type is activated.

Two filter types are available for selection: a low-pass filter and an RRC filter.

By default, the low-pass filter is active. The low-pass filter affects the quality of the measured signal compared to a measurement without a filter.

The RRC filter comes with an integrated Hamming window. If selected, two more settings become available for configuration: the Roll-Off Factor and the Cut Off Frequency.

Remote command:
`CONFigure:CDPower[:BTS]:MCARrier:FILTer:TYPE` on page 145

Roll-Off Factor ← Filter Type ← Multi Carrier
Defines the roll-off factor of the RRC filter which defines the slope of the filter curve and therefore the excess bandwidth of the filter. Possible values are between 0.01 and 0.99 in 0.01 steps. The default value is 0.02.

This parameter is available for the RRC filter.

Remote command:
`CONFigure:CDPower[:BTS]:MCARrier:FILTer:TYPE` on page 145
`CONFigure:CDPower[:BTS]:MCARrier:FILTer:ROFF` on page 144

Cut Off Frequency ← Filter Type ← Multi Carrier
Defines the frequency at which the passband of the RRC filter begins. Possible values are between 0.1 MHz and 2.4 MHz in 1 Hz steps. The default value is 1.25 MHz

This parameter is available for the RRC filter.

Remote command:
`CONFigure:CDPower[:BTS]:MCARrier:FILTer:TYPE` on page 145
`CONFigure:CDPower[:BTS]:MCARrier:FILTer:COFRequency` on page 144

6.2.4 Data Input and Output Settings

The R&S FSW can analyze signals from different input sources and provide various types of output (such as noise or trigger signals).

- Input Source Settings....62
- Output Settings....69
- Digital I/Q Output Settings....72

6.2.4.1 Input Source Settings

The input source determines which data the R&S FSW will analyze.

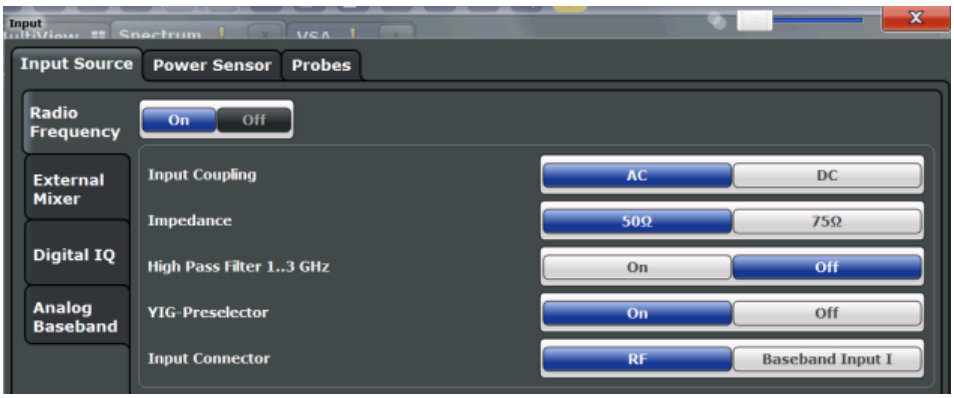
Input settings can be configured via the INPUT/OUTPUT key, in the "Input" dialog box.

Some settings are also available in the "Amplitude" tab of the "Amplitude" dialog box.

- Radio Frequency Input....63
- Digital I/Q Input Settings....64
- Analog Baseband Input Settings....66
- Probe Settings....69

Radio Frequency Input

The default input source for the R&S FSW is "Radio Frequency", i.e. the signal at the RF INPUT connector on the front panel of the R&S FSW. If no additional options are installed, this is the only available input source.



Radio Frequency State....63
Input Coupling....63
Impedance....63
High-Pass Filter 1...3 GHz....64
YIG-Preselector....64
Input Connector....64

Radio Frequency State

Activates input from the RF INPUT connector.

Remote command:
`INPut:SELect` on page 152

Input Coupling

The RF input of the R&S FSW can be coupled by alternating current (AC) or direct current (DC).

This function is not available for input from the Digital Baseband Interface (R&S FSW-B17) or from the Analog Baseband Interface (R&S FSW-B71).

AC coupling blocks any DC voltage from the input signal. This is the default setting to prevent damage to the instrument. Very low frequencies in the input signal may be distorted.

However, some specifications require DC coupling. In this case, you must protect the instrument from damaging DC input voltages manually. For details, refer to the data sheet.

Remote command:
`INPut:COUPling` on page 150

Impedance

The reference impedance for the measured levels of the R&S FSW can be set to 50 Ω or 75 Ω.

75 Ω should be selected if the 50 Ω input impedance is transformed to a higher impedance using a 75 Ω adapter of the RAZ type (= 25 Ω in series to the input impedance of the instrument). The correction value in this case is 1.76 dB = 10 log (75Ω/50Ω).

This value also affects the unit conversion (see "Reference Level" on page 76).

This function is not available for input from the Digital Baseband Interface (R&S FSW-B17) or from the Analog Baseband Interface (R&S FSW-B71). For analog baseband input, an impedance of 50 Ω is always used.

Remote command:
`INPut:IMPedance` on page 151

High-Pass Filter 1...3 GHz
Activates an additional internal high-pass filter for RF input signals from 1 GHz to 3 GHz. This filter is used to remove the harmonics of the R&S FSW in order to measure the harmonics for a DUT, for example.

This function requires option R&S FSW-B13.

(Note: for RF input signals outside the specified range, the high-pass filter has no effect. For signals with a frequency of approximately 4 GHz upwards, the harmonics are suppressed sufficiently by the YIG filter.)

Remote command:
`INPut:FILTer:HPASs[:STATe]` on page 151

YIG-Preselector
Activates or deactivates the YIG-preselector.

An internal YIG-preselector at the input of the R&S FSW ensures that image frequencies are rejected. However, this is only possible for a restricted bandwidth. In order to use the maximum bandwidth for signal analysis you can deactivate the YIG-preselector at the input of the R&S FSW, which may lead to image-frequency display.

Note that the YIG-preselector is active only on frequencies greater than 8 GHz. Therefore, switching the YIG-preselector on or off has no effect if the frequency is below that value.

`INPut:FILTer:YIG[:STATe]` on page 151

Input Connector
Determines whether the RF input data is taken from the RF INPUT connector (default) or the optional BASEBAND INPUT I connector. This setting is only available if the Analog Baseband Interface (R&S FSW-B71) is installed and active for input.

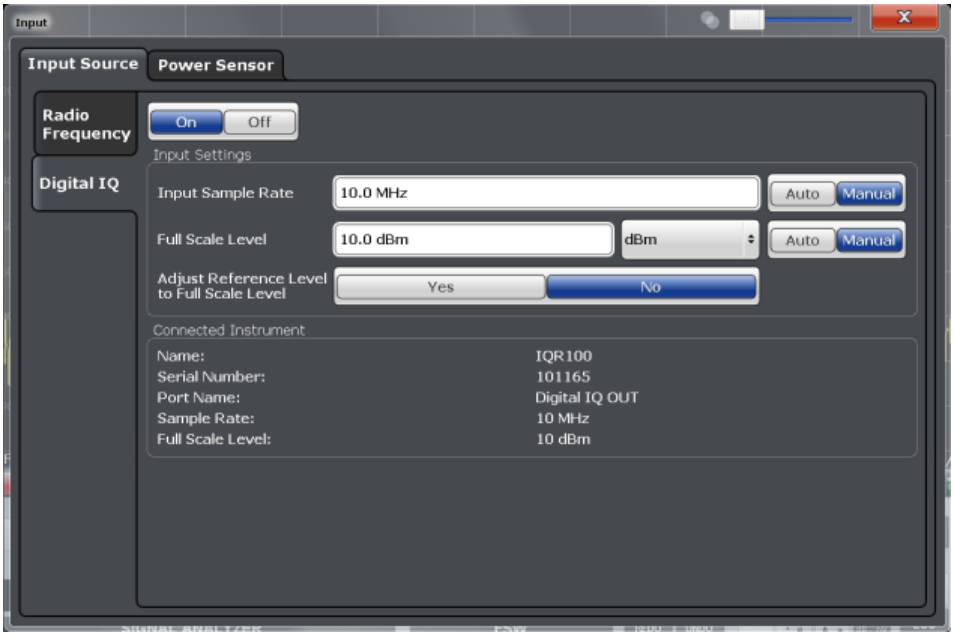
For more information on the Analog Baseband Interface (R&S FSW-B71) see the R&S FSW I/Q Analyzer and I/Q Input User Manual.

Remote command:
`INPut:CONNector` on page 150

Digital I/Q Input Settings

The following settings and functions are available to provide input via the Digital Baseband Interface (R&S FSW-B17) in the applications that support it.

They can be configured via the INPUT/OUTPUT key, in the "Input" dialog box.



For more information see the R&S FSW I/Q Analyzer and I/Q Input User Manual.

Digital I/Q Input State....65
Input Sample Rate....65
Full Scale Level....65
Adjust Reference Level to Full Scale Level....66
Connected Instrument....66
DigIConf....66

Digital I/Q Input State
Enables or disable the use of the "Digital IQ" input source for measurements. "Digital IQ" is only available if the Digital Baseband Interface (R&S FSW-B17) is installed.

Remote command:
`INPut:SELect` on page 152

Input Sample Rate
Defines the sample rate of the digital I/Q signal source. This sample rate must correspond with the sample rate provided by the connected device, e.g. a generator.

If "Auto" is selected, the sample rate is adjusted automatically by the connected device.

The allowed range is from 100 Hz to 10 GHz.

Remote command:
`INPut:DIQ:SRATe` on page 156
`INPut:DIQ:SRATe:AUTO` on page 156

Full Scale Level
The "Full Scale Level" defines the level and unit that should correspond to an I/Q sample with the magnitude "1".

If "Auto" is selected, the level is automatically set to the value provided by the connected device.

Remote command:
INPut:DIQ:RANGe[:UPPer] on page 155
INPut:DIQ:RANGe[:UPPer]:UNIT on page 155
INPut:DIQ:RANGe[:UPPer]:AUTO on page 154

Adjust Reference Level to Full Scale Level
If enabled, the reference level is adjusted to the full scale level automatically if any change occurs.

Remote command:
INPut:DIQ:RANGe:COUPling on page 155

Connected Instrument
Displays the status of the Digital Baseband Interface connection.

If an instrument is connected, the following information is displayed:

- Name and serial number of the instrument connected to the Digital Baseband Interface
- Used port
- Sample rate of the data currently being transferred via the Digital Baseband Interface
- Level and unit that corresponds to an I/Q sample with the magnitude "1" (Full Scale Level), if provided by connected instrument

Remote command:
INPut:DIQ:CDEVice on page 153

DigIConf
Starts the optional R&S DigIConf application. This softkey is available in the In-/Output menu, but only if the optional software is installed.

Note that R&S DigIConf requires a USB connection (not LAN!) from the R&S FSW to the R&S EX-IQ-BOX in addition to the Digital Baseband Interface (R&S FSW-B17) connection. R&S DigIConf version 2.20.360.86 Build 170 or higher is required.

To return to the R&S FSW application, press any key on the front panel. The R&S FSW application is displayed with the "Input/Output" menu, regardless of which key was pressed.

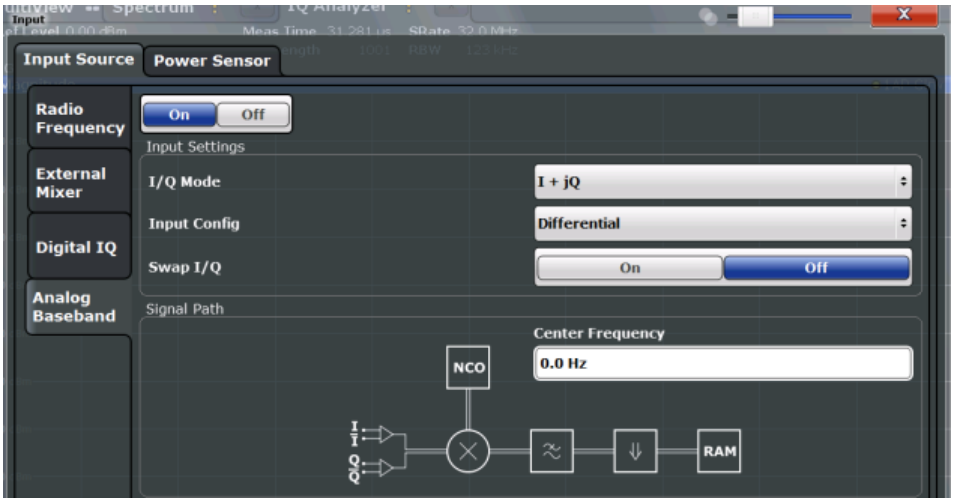
For details on the R&S DigIConf application, see the "R&S®EX-IQ-BOX Digital Interface Module R&S®DigIConf Software Operating Manual".

Note: If you close the R&S DigIConf window using the "Close" icon, the window is minimized, not closed.
If you select the "File > Exit" menu item in the R&S DigIConf window, the application is closed. Note that in this case the settings are lost and the EX-IQ-BOX functionality is no longer available until you restart the application using the "DigIConf" softkey in the R&S FSW once again.

Analog Baseband Input Settings

The following settings and functions are available to provide input via the Analog Baseband Interface (R&S FSW-B71) in the applications that support it.

They can be configured via the INPUT/OUTPUT key, in the "Input" dialog box.



For more information on the Analog Baseband Interface (R&S FSW-B71) see the R&S FSW I/Q Analyzer and I/Q Input User Manual.

If Analog Baseband input is used, measurements in the frequency and time domain are not available.

Analog Baseband Input State....67
I/Q Mode....67
Input configuration....68
Swap I/Q....68
Center Frequency....68

Analog Baseband Input State
Enables or disable the use of the "Analog Baseband" input source for measurements. "Analog Baseband" is only available if the Analog Baseband Interface (R&S FSW-B71) is installed.

Remote command:
`INPut:SELect` on page 152

I/Q Mode
Defines the format of the input signal.

For more information on I/Q data processing modes see the R&S FSW I/Q Analyzer and I/Q Input User Manual.

"I + jQ" The input signal is filtered and resampled to the sample rate of the application.
Two inputs are required for a complex signal, one for the in-phase component, and one for the quadrature component.

"I Only / Low IF I"
The input signal at the BASEBAND INPUT I connector is filtered and resampled to the sample rate of the application.
If the center frequency is not 0, the input signal is down-converted first (**Low IF I**).

"Q Only / Low IF Q"
The input signal at the BASEBAND INPUT Q connector is filtered and resampled to the sample rate of the application.
If the center frequency is not 0, the input signal is down-converted first (**Low IF Q**).

Remote command:
`INPut:IQ:TYPE` on page 161

Input configuration
Defines whether the input is provided as a differential signal via all 4 Analog Baseband connectors or as a plain I/Q signal via 2 simple-ended lines.

Note: Both single-ended and differential probes are supported as input; however, since only one connector is occupied by a probe, the "Single-ended" setting must be used for all probes.

"Differential" I, Q and inverse I,Q data

"Single Ended" I, Q data only

Remote command:
`INPut:IQ:BALanced[:STATe]` on page 160

Swap I/Q
Activates or deactivates the inverted I/Q modulation. If the I and Q parts of the signal from the DUT are interchanged, the R&S FSW can do the same to compensate for it.

On	I and Q signals are interchanged Inverted sideband, Q+j*I
Off	I and Q signals are not interchanged Normal sideband, I+j*Q

Remote command:
`[SENSe:]SWAPiq` on page 162

Center Frequency
Defines the center frequency for analog baseband input.

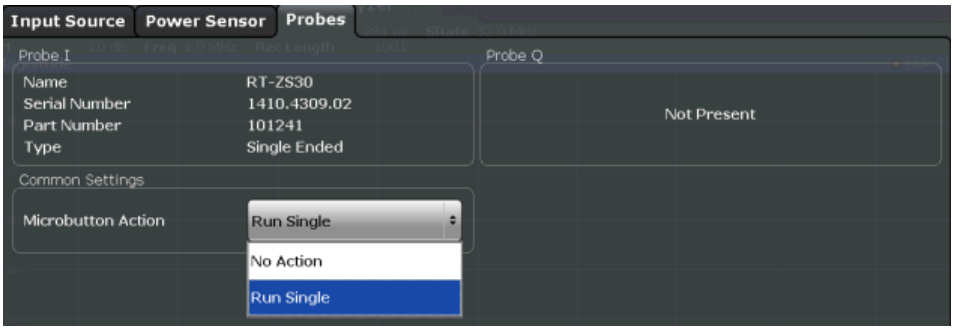
For real-type baseband input (I or Q only), the center frequency is always 0 Hz.

Note: If the analysis bandwidth to either side of the defined center frequency exceeds the minimum frequency (0 Hz) or the maximum frequency (40 MHz/80 MHz), an error is displayed. In this case, adjust the center frequency or the analysis bandwidth.

Remote command:
`[SENSe:]FREQuency:CENTer` on page 166

Probe Settings

Probes are configured in a separate tab on the "Input" dialog box which is displayed when you select the INPUT/OUTPUT key and then "Input Source Config".



For each possible probe connector (Baseband Input I, Baseband Input Q), the detected type of probe, if any, is displayed. The following information is provided for each connected probe:

- Probe name
- Serial number
- R&S part number
- Type of probe ("Differential", "Single Ended")

For more information on using probes with an R&S FSW, see the R&S FSW User Manual.

For general information on the R&S®RTO probes, see the device manuals.

Microbutton Action.....69

Microbutton Action
Active R&S probes (except for RT-ZS10E) have a configurable microbutton on the probe head. By pressing this button, you can perform an action on the instrument directly from the probe.

Select the action that you want to start from the probe:

"Run single" Starts one data acquisition.

"No action" Prevents unwanted actions due to unintended usage of the microbutton.

Remote command:
`[SENSe:]PROBe<p>:SETup:MODE` on page 163

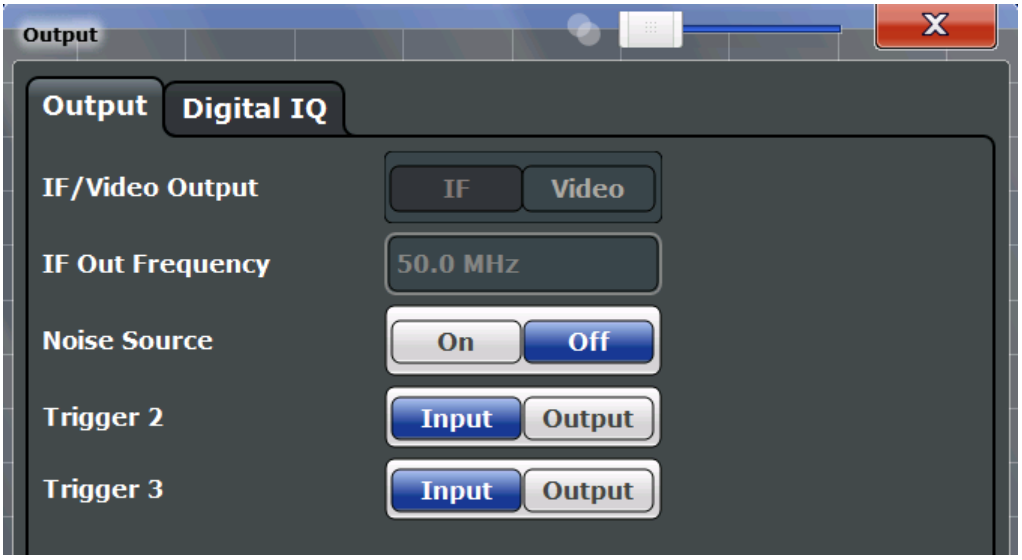
6.2.4.2 Output Settings

The R&S FSW can provide output to special connectors for other devices.

For details on connectors refer to the R&S FSW Getting Started manual, "Front / Rear Panel View" chapters.

How to provide trigger signals as output is described in detail in the R&S FSW User Manual.

Output settings can be configured via the INPUT/OUTPUT key or in the "Outputs" dialog box.



Noise Source....70
Trigger 2/3....70
└ Output Type....71
└ Level....71
└ Pulse Length....71
└ Send Trigger....71

Noise Source
Switches the supply voltage for an external noise source on or off.

External noise sources are useful when you are measuring power levels that fall below the noise floor of the R&S FSW itself, for example when measuring the noise level of a DUT.

Remote command:
`DIAGnostic:SERVice:NSOurce` on page 165

Trigger 2/3
Defines the usage of the variable TRIGGER INPUT/OUTPUT connectors, where:

"Trigger 2": TRIGGER INPUT/OUTPUT connector on the front panel

"Trigger 3": TRIGGER 3 INPUT/ OUTPUT connector on the rear panel

(Trigger 1 is INPUT only.)

Note: Providing trigger signals as output is described in detail in the R&S FSW User Manual.

"Input" The signal at the connector is used as an external trigger source by the R&S FSW. No further trigger parameters are available for the connector.

"Output" The R&S FSW sends a trigger signal to the output connector to be used by connected devices.
Further trigger parameters are available for the connector.

Remote command:
`OUTPut:TRIGger<port>:LEVel` on page 181
`OUTPut:TRIGger<port>:DIRection` on page 180

Output Type ← Trigger 2/3
Type of signal to be sent to the output

"Device Triggered" (Default) Sends a trigger when the R&S FSW triggers.

"Trigger Armed" Sends a (high level) trigger when the R&S FSW is in "Ready for trigger" state.
This state is indicated by a status bit in the `STATus:OPERation` register (bit 5), as well as by a low level signal at the AUX port (pin 9).

"User Defined" Sends a trigger when user selects "Send Trigger" button.
In this case, further parameters are available for the output signal.

Remote command:
`OUTPut:TRIGger<port>:OTYPe` on page 181

Level ← Output Type ← Trigger 2/3
Defines whether a constant high (1) or low (0) signal is sent to the output connector.

Remote command:
`OUTPut:TRIGger<port>:LEVel` on page 181

Pulse Length ← Output Type ← Trigger 2/3
Defines the length of the pulse sent as a trigger to the output connector.

Remote command:
`OUTPut:TRIGger<port>:PULSe:LENGth` on page 182

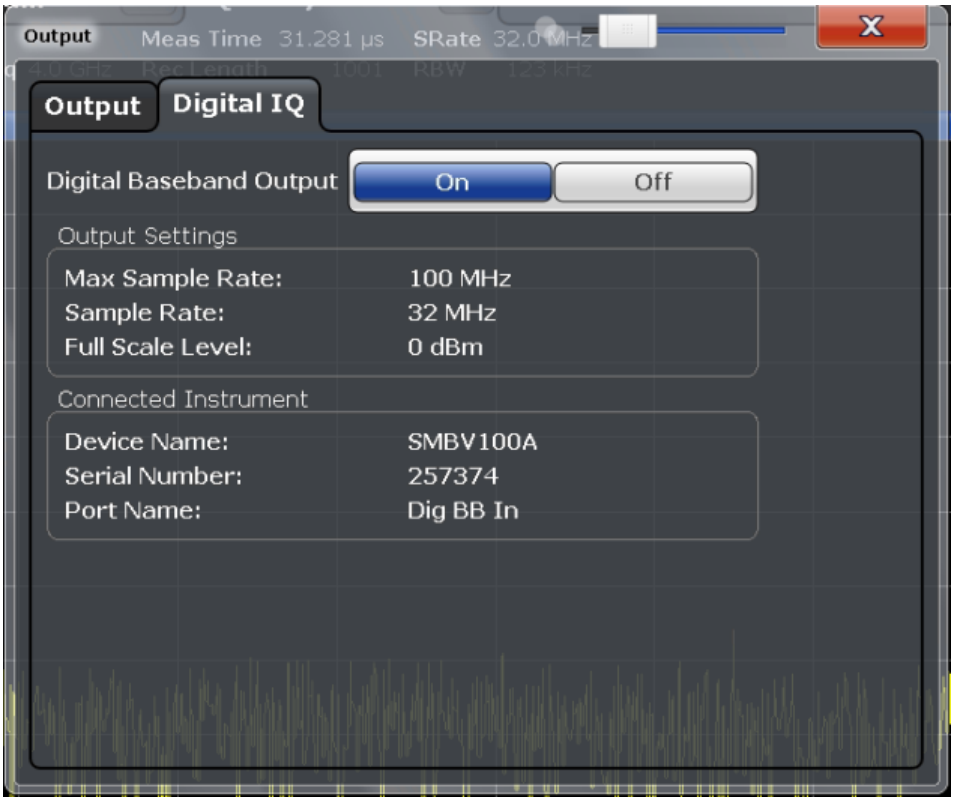
Send Trigger ← Output Type ← Trigger 2/3
Sends a user-defined trigger to the output connector immediately. Note that the trigger pulse level is always opposite to the constant signal level defined by the output "Level" setting, e.g. for "Level = High", a constant high signal is output to the connector until the "Send Trigger" button is selected. Then, a low pulse is sent.

Which pulse level will be sent is indicated by a graphic on the button.

Remote command:
`OUTPut:TRIGger<port>:PULSe:IMMediate` on page 181

6.2.4.3 Digital I/Q Output Settings

The optional Digital Baseband Interface (R&S FSW-B17) allows you to output I/Q data from any R&S FSW application that processes I/Q data to an external device. The configuration settings for digital I/Q output can be configured via the INPUT/OUTPUT key or in the "Outputs" dialog box.



For details on digital I/Q output see the R&S FSW I/Q Analyzer User Manual.

Digital Baseband Output....72
Output Settings Information....72
Connected Instrument....73

Digital Baseband Output
Enables or disables a digital output stream to the optional Digital Baseband Interface (R&S FSW-B17), if available.

For details on digital I/Q output see the R&S FSW I/Q Analyzer User Manual.

Remote command:
`OUTPut:DIQ` on page 156

Output Settings Information
Displays information on the settings for output via the Digital Baseband Interface (R&S FSW-B17).

The following information is displayed:

- Maximum sample rate that can be used to transfer data via the Digital Baseband Interface (i.e. the maximum input sample rate that can be processed by the connected instrument)
- Sample rate currently used to transfer data via the Digital Baseband Interface
- Level and unit that corresponds to an I/Q sample with the magnitude "1" (Full Scale Level)

Remote command:
`OUTPut:DIQ:CDEVice` on page 156

Connected Instrument
Displays information on the instrument connected to the Digital Baseband Interface (R&S FSW-B17), if available.

If an instrument is connected, the following information is displayed:

- Name and serial number of the instrument connected to the Digital Baseband Interface
- Used port

Remote command:
`OUTPut:DIQ:CDEVice` on page 156

6.2.5 Frontend Settings

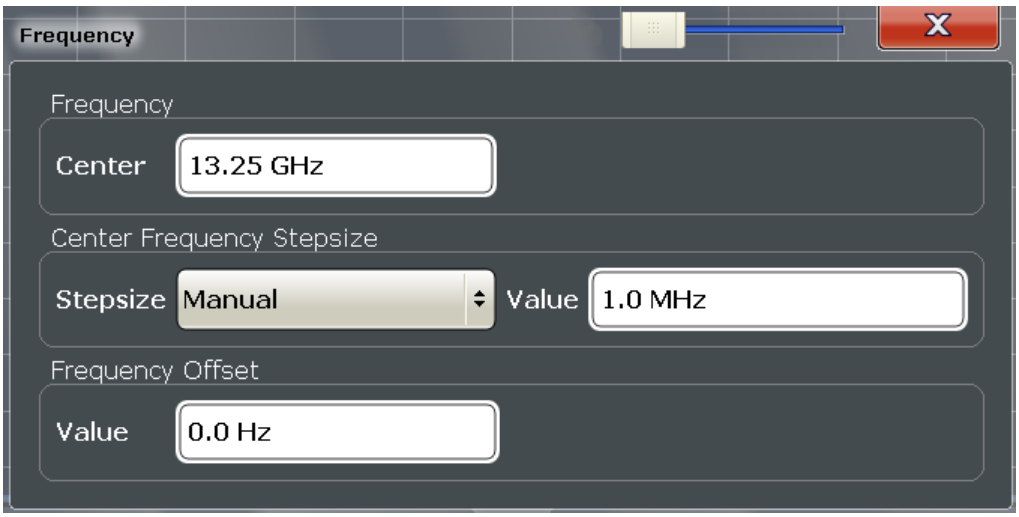
The frequency, amplitude and y-axis scaling settings represent the "frontend" of the measurement setup.

- Frequency Settings....73
- Amplitude Settings....75
- Amplitude Settings for Analog Baseband Input....78
- Y-Axis Scaling....81

6.2.5.1 Frequency Settings

Frequency settings for the input signal can be configured via the "Frequency" dialog box, which is displayed when you do one of the following:

- Select the FREQ key and then the "Frequency Config" softkey.
- Select the "Frequency" tab in the "Input Settings" dialog box



Center....74
Center Frequency Stepsize....74
Frequency Offset....74

Center
Defines the normal center frequency of the signal. The allowed range of values for the center frequency depends on the frequency span.

span > 0: $span_{min}/2 \leq f_{center} \leq f_{max} - span_{min}/2$

f_{max} and $span_{min}$ are specified in the data sheet.

Remote command:
`[SENSe:]FREQuency:CENTer` on page 166

Center Frequency Stepsize
Defines the step size by which the center frequency is increased or decreased when the arrow keys are pressed. When you use the rotary knob the center frequency changes in steps of only 1/10 of the "Center Frequency Stepsize".

The step size can be coupled to another value or it can be manually set to a fixed value.

This setting is available for frequency and time domain measurements.

"X * Span" Sets the step size for the center frequency to a defined factor of the span. The "X-Factor" defines the percentage of the span.
Values between 1 and 100 % in steps of 1 % are allowed. The default setting is 10 %.

"= Center" Sets the step size to the value of the center frequency. The used value is indicated in the "Value" field.

"Manual" Defines a fixed step size for the center frequency. Enter the step size in the "Value" field.

Remote command:
`[SENSe:]FREQuency:CENTer:STEP` on page 166

Frequency Offset
Shifts the displayed frequency range along the x-axis by the defined offset.

This parameter has no effect on the R&S FSW hardware, or on the captured data or on data processing. It is simply a manipulation of the final results in which absolute frequency values are displayed. Thus, the x-axis of a spectrum display is shifted by a constant offset if it shows absolute frequencies, but not if it shows frequencies relative to the signal's center frequency.

A frequency offset can be used to correct the display of a signal that is slightly distorted by the measurement setup, for example.

The allowed values range from -100 GHz to 100 GHz. The default setting is 0 Hz.

Remote command:
`[SENSe:]FREQuency:OFFSet` on page 168

6.2.5.2 Amplitude Settings

Amplitude settings determine how the R&S FSW must process or display the expected input power levels.

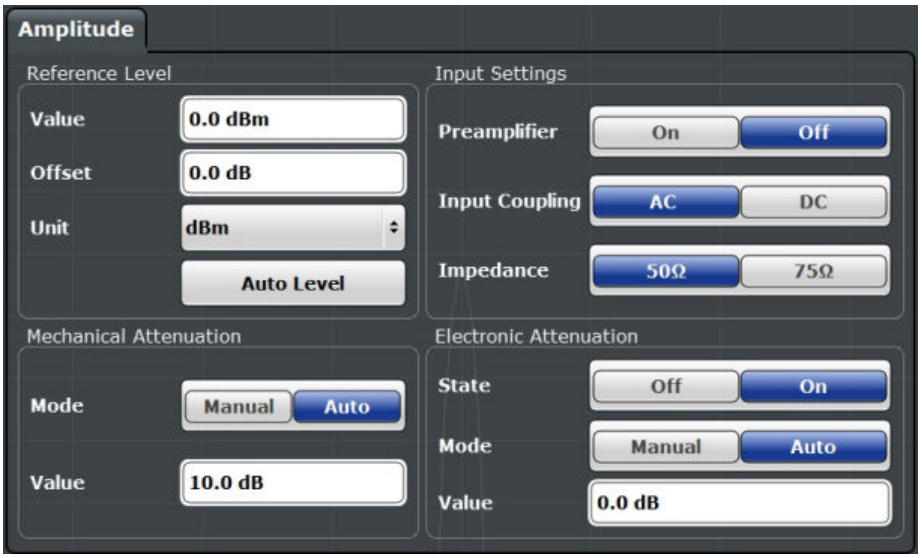
Amplitude settings for input from the Analog Baseband interface (R&S FSW-B71) are described in chapter 6.2.5.3, "Amplitude Settings for Analog Baseband Input", on page 78.

To configure the amplitude settings

Amplitude settings can be configured via the AMPT key or in the "Amplitude" dialog box.

► To display the "Amplitude" dialog box, do one of the following:

- Select "Input/Frontend" from the "Overview" and then switch to the "Amplitude" tab.
- Select the AMPT key and then the "Amplitude Config" softkey.



Reference Level....76
└ Shifting the Display (Offset)....76
└ Unit....76

└ Setting the Reference Level Automatically (Auto Level)....76
RF Attenuation....77
└ Attenuation Mode / Value....77
Using Electronic Attenuation (Option B25)....77
Input Settings....78
└ Preamplifier (option B24)....78

Reference Level
Defines the expected maximum reference level. Signal levels above this value may not be measured correctly, which is indicated by the "IF OVLD" status display ("OVLD" for analog baseband or digitial baseband input).

The reference level is also used to scale power diagrams; the reference level is then used as the maximum on the y-axis.

Since the R&S FSW hardware is adapted according to this value, it is recommended that you set the reference level close above the expected maximum signal level to ensure an optimum measurement (no compression, good signal-to-noise ratio).

Note that the "Reference Level" value ignores the Shifting the Display (Offset). It is important to know the actual power level the R&S FSW must handle.

Remote command:
`DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:RLEVel` on page 170

Shifting the Display (Offset) ← Reference Level
Defines an arithmetic level offset. This offset is added to the measured level irrespective of the selected unit. The scaling of the y-axis is changed accordingly.

Define an offset if the signal is attenuated or amplified before it is fed into the R&S FSW so the application shows correct power results. All displayed power level results will be shifted by this value.

Note, however, that the Reference Level value ignores the "Reference Level Offset". It is important to know the actual power level the R&S FSW must handle.

To determine the required offset, consider the external attenuation or gain applied to the input signal. A positive value indicates that an attenuation took place (R&S FSW increases the displayed power values) , a negative value indicates an external gain (R&S FSW decreases the displayed power values).

The setting range is ±200 dB in 0.01 dB steps.

Remote command:
`DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:RLEVel:OFFSet` on page 170

Unit ← Reference Level
For CDA measurements the unit should not be changed, as this would lead to useless results.

Setting the Reference Level Automatically (Auto Level) ← Reference Level
Automatically determines the optimal reference level for the current input data. At the same time, the internal attenuators and the preamplifier (for analog baseband input: the fullscale level) are adjusted so the signal-to-noise ratio is optimized, while signal compression, clipping and overload conditions are minimized.

In order to do so, a level measurement is performed to determine the optimal reference level.

You can change the measurement time for the level measurement if necessary (see "Changing the Automatic Measurement Time (Meastime Manual)" on page 100).

Remote command:
[SENSe:]ADJust:LEVel on page 194

RF Attenuation
Defines the attenuation applied to the RF input.

This function is not available for input from the Digital Baseband Interface (R&S FSW-B17).

Attenuation Mode / Value ← RF Attenuation
The RF attenuation can be set automatically as a function of the selected reference level (Auto mode). This ensures that the optimum RF attenuation is always used. It is the default setting. By default and when Using Electronic Attenuation (Option B25) is not available, mechanical attenuation is applied.

This function is not available for input from the **Digital Baseband Interface (R&S FSW-B17)**.

In "Manual" mode, you can set the RF attenuation in 1 dB steps (down to 0 dB, also using the rotary knob). Other entries are rounded to the next integer value. The range is specified in the data sheet. If the defined reference level cannot be set for the defined RF attenuation, the reference level is adjusted accordingly and the warning "Limit reached" is displayed.

NOTICE! Risk of hardware damage due to high power levels. When decreasing the attenuation manually, ensure that the power level does not exceed the maximum level allowed at the RF input, as an overload may lead to hardware damage.

Remote command:
INPut:ATTenuation on page 171
INPut:ATTenuation:AUTO on page 172

Using Electronic Attenuation (Option B25)
If option R&S FSW-B25 is installed, you can also activate an electronic attenuator.

In "Auto" mode, the settings are defined automatically; in "Manual" mode, you can define the mechanical and electronic attenuation separately.

This function is not available for input from the Digital Baseband Interface (R&S FSW-B17).

Note: Electronic attenuation is not available for stop frequencies (or center frequencies in zero span) >13.6 GHz.
In "Auto" mode, RF attenuation is provided by the electronic attenuator as much as possible to reduce the amount of mechanical switching required. Mechanical attenuation may provide a better signal-to-noise ratio, however.

When you switch off electronic attenuation, the RF attenuation is automatically set to the same mode (auto/manual) as the electronic attenuation was set to. Thus, the RF attenuation may be set to automatic mode, and the full attenuation is provided by the mechanical attenuator, if possible.

Both the electronic and the mechanical attenuation can be varied in 1 dB steps. Other entries are rounded to the next lower integer value.

If the defined reference level cannot be set for the given attenuation, the reference level is adjusted accordingly and the warning "Limit reached" is displayed in the status bar.

Remote command:
`INPut:EATT:STATe` on page 173
`INPut:EATT:AUTO` on page 173
`INPut:EATT` on page 172

Input Settings
Some input settings affect the measured amplitude of the signal, as well.

The parameters "Input Coupling" and "Impedance" are identical to those in the "Input" settings, see chapter 6.2.4.1, "Input Source Settings", on page 62.

Preamplifier (option B24) ← Input Settings
If option R&S FSW-B24 is installed, a preamplifier can be activated for the RF input signal.

This function is not available for input from the Digital Baseband Interface (R&S FSW-B17).

For R&S FSW 26 models, the input signal is amplified by 30 dB if the preamplifier is activated.

For R&S FSW 8 or 13 models, the following settings are available:

You can use a preamplifier to analyze signals from DUTs with low input power.

"Off" Deactivates the preamplifier.

"15 dB" The RF input signal is amplified by about 15 dB.

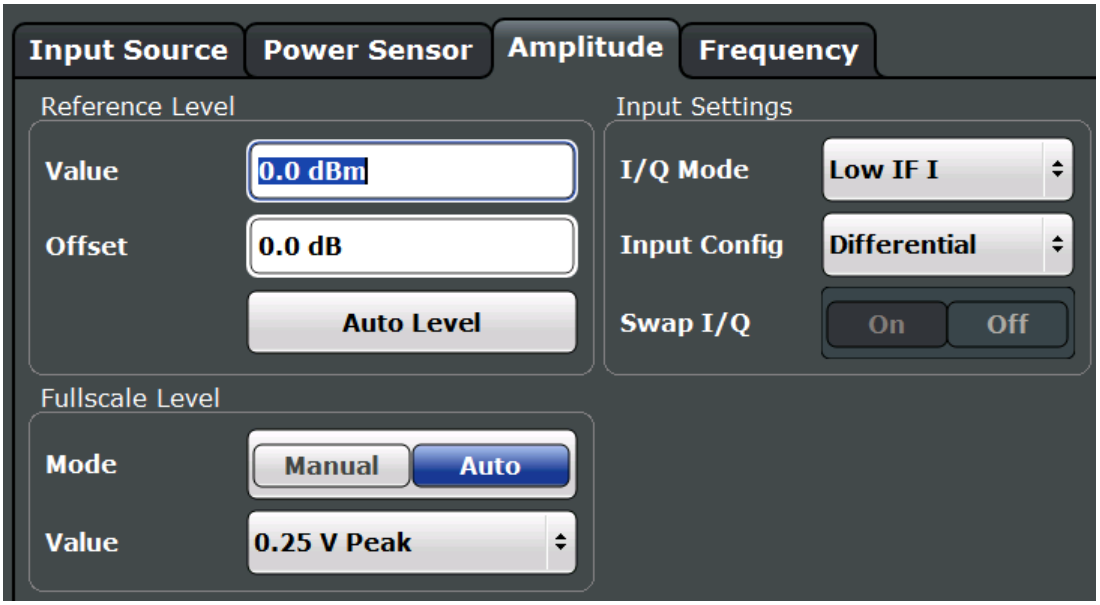
"30 dB" The RF input signal is amplified by about 30 dB.

Remote command:
`INPut:GAIN:STATe` on page 170
`INPut:GAIN[:VALue]` on page 171

6.2.5.3 Amplitude Settings for Analog Baseband Input

The following settings and functions are available to define amplitude settings for input via the Analog Baseband Interface (R&S FSW-B71) in the applications that support it.

They can be configured via the AMPT key or in the "Amplitude" tab of the "Input" dialog box.



The input settings provided here are identical to those in the "Input Source" > "Analog Baseband" tab, see "Analog Baseband Input Settings" on page 66.

For more information on the Analog Baseband Interface (R&S FSW-B71) see the R&S FSW I/Q Analyzer and I/Q Input User Manual.

Reference Level....79
└ Shifting the Display (Offset)....79
└ Unit....80
└ Setting the Reference Level Automatically (Auto Level)....80
Fullscale Level Mode / Value....80

Reference Level
Defines the expected maximum reference level. Signal levels above this value may not be measured correctly, which is indicated by the "IF OVLD" status display ("OVLD" for analog baseband or digitial baseband input).

The reference level is also used to scale power diagrams; the reference level is then used as the maximum on the y-axis.

Since the R&S FSW hardware is adapted according to this value, it is recommended that you set the reference level close above the expected maximum signal level to ensure an optimum measurement (no compression, good signal-to-noise ratio).

Note that the "Reference Level" value ignores the Shifting the Display (Offset). It is important to know the actual power level the R&S FSW must handle.

Remote command:
`DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:RLEVel` on page 170

Shifting the Display (Offset) ← Reference Level
Defines an arithmetic level offset. This offset is added to the measured level irrespective of the selected unit. The scaling of the y-axis is changed accordingly.

Define an offset if the signal is attenuated or amplified before it is fed into the R&S FSW so the application shows correct power results. All displayed power level results will be shifted by this value.

Note, however, that the Reference Level value ignores the "Reference Level Offset". It is important to know the actual power level the R&S FSW must handle.

To determine the required offset, consider the external attenuation or gain applied to the input signal. A positive value indicates that an attenuation took place (R&S FSW increases the displayed power values) , a negative value indicates an external gain (R&S FSW decreases the displayed power values).

The setting range is ±200 dB in 0.01 dB steps.

Remote command:
`DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:RLEVel:OFFSet` on page 170

Unit ← Reference Level
For CDA measurements the unit should not be changed, as this would lead to useless results.

Setting the Reference Level Automatically (Auto Level) ← Reference Level
Automatically determines the optimal reference level for the current input data. At the same time, the internal attenuators and the preamplifier (for analog baseband input: the fullscale level) are adjusted so the signal-to-noise ratio is optimized, while signal compression, clipping and overload conditions are minimized.

In order to do so, a level measurement is performed to determine the optimal reference level.

You can change the measurement time for the level measurement if necessary (see "Changing the Automatic Measurement Time (Meastime Manual)" on page 100).

Remote command:
`[SENSe:]ADJust:LEVel` on page 194

Fullscale Level Mode / Value
The fullscale level defines the maximum power you can input at the Baseband Input connector without clipping the signal.

The fullscale level can be defined automatically according to the reference level, or manually.

For manual input, the following values can be selected:

- 0.25 V
- 0.5 V
- 1 V
- 2 V

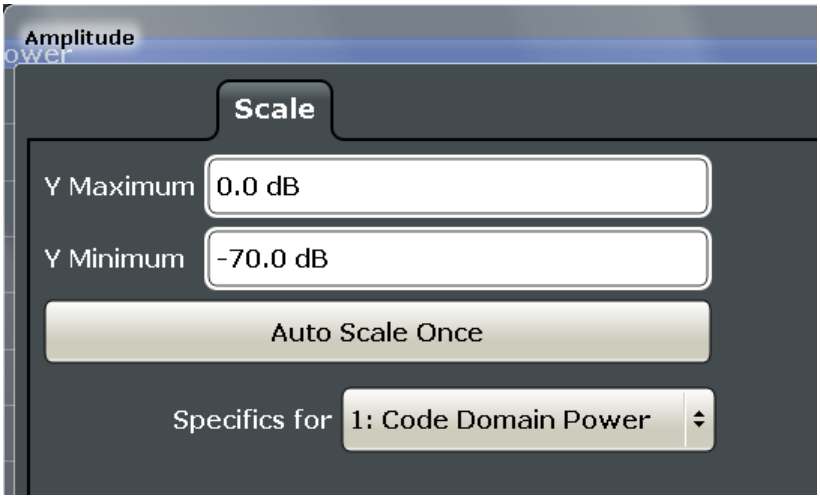
If probes are connected, the possible fullscale values are adapted according to the probe's attenuation and maximum allowed power.

For details on probes see the R&S FSW I/Q Analyzer and I/Q Input User Manual.

Remote command:
`INPut:IQ:FULLscale:AUTO` on page 161
`INPut:IQ:FULLscale:LEVel` on page 161

6.2.5.4 Y-Axis Scaling

The vertical axis scaling is configurable. In Code Domain Analysis, the y-axis usually displays the measured power levels.



Y-Maximum, Y-Minimum....81
Auto Scale Once....81

Y-Maximum, Y-Minimum
Defines the amplitude range to be displayed on the y-axis of the evaluation diagrams.

Remote command:
`DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:MAXimum` on page 169
`DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:MINimum` on page 169

Auto Scale Once
Automatically determines the optimal range and reference level position to be displayed for the current measurement settings.

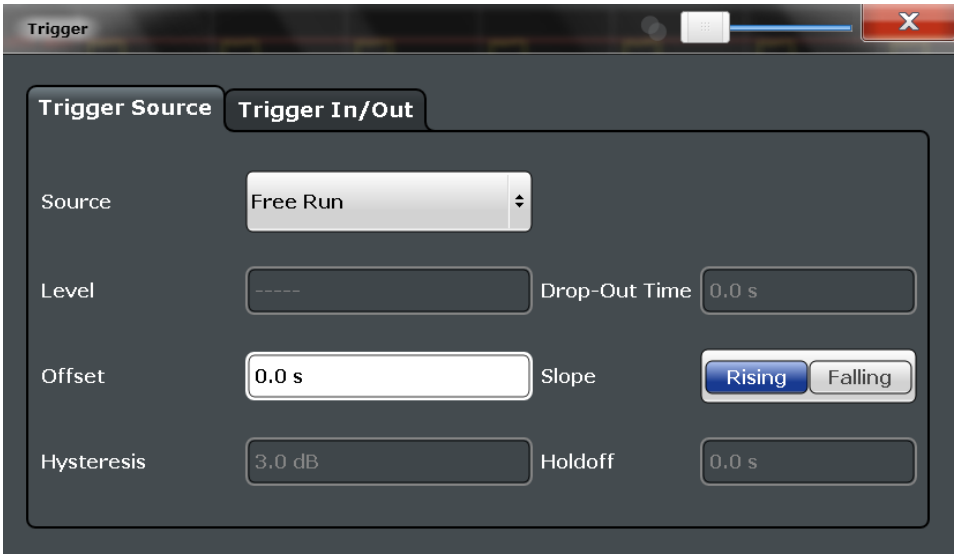
The display is only set once; it is not adapted further if the measurement settings are changed again.

Remote command:
`DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:AUTO ONCE` on page 169

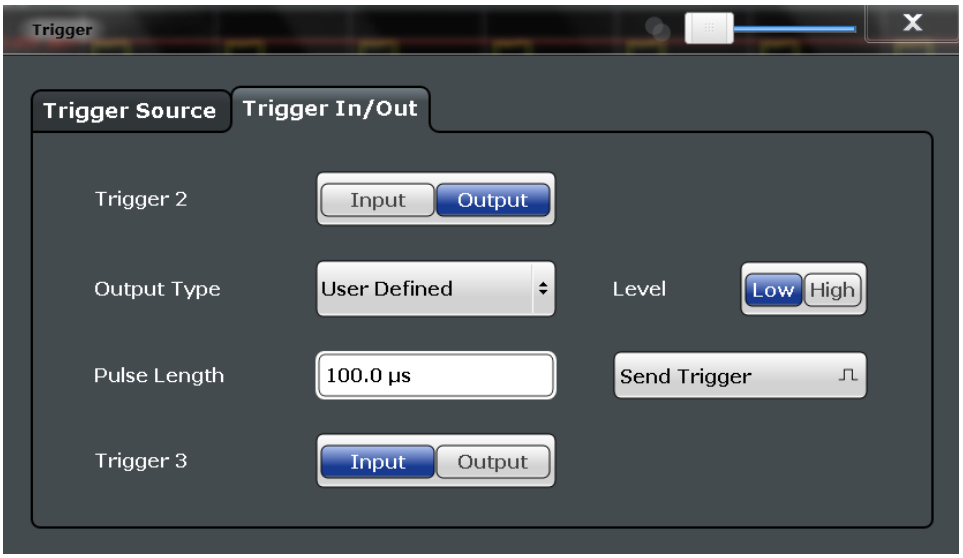
6.2.6 Trigger Settings

Trigger settings determine when the input signal is measured.

Trigger settings can be configured via the TRIG key or in the "Trigger" dialog box, which is displayed when you select the "Trigger" button in the "Overview".



External triggers from one of the TRIGGER INPUT/OUTPUT connectors on the R&S FSW are configured in a separate tab of the dialog box.



For step-by-step instructions on configuring triggered measurements, see the main R&S FSW User Manual.

Trigger Source....83
└ Trigger Source....83
└ Free Run....83
└ External Trigger 1/2/3....83
└ Digital I/Q....84
└ IF Power....84
└ Trigger Level....84
└ Drop-Out Time....85
└ Trigger Offset....85
└ Hysteresis....85
└ Trigger Holdoff....85

└ Slope....85
└ Capture Offset....86
Trigger 2/3....86
└ Output Type....86
└ Level....86
└ Pulse Length....87
└ Send Trigger....87

Trigger Source
The trigger settings define the beginning of a measurement.

Trigger Source ← Trigger Source
Defines the trigger source. If a trigger source other than "Free Run" is set, "TRG" is displayed in the channel bar and the trigger source is indicated.

Remote command:
`TRIGger[:SEQuence]:SOURce` on page 178

Free Run ← Trigger Source ← Trigger Source
No trigger source is considered. Data acquisition is started manually or automatically and continues until stopped explicitely.

Remote command:
`TRIG:SOUR IMM`, see `TRIGger[:SEQuence]:SOURce` on page 178

External Trigger 1/2/3 ← Trigger Source ← Trigger Source
Data acquisition starts when the TTL signal fed into the specified input connector (on the front or rear panel) meets or exceeds the specified trigger level.

(See "Trigger Level" on page 84).

Note: The "External Trigger 1" softkey automatically selects the trigger signal from the TRIGGER INPUT connector on the front panel.

For details see the "Instrument Tour" chapter in the R&S FSW Getting Started manual.

"External Trigger 1"
Trigger signal from the TRIGGER INPUT connector on the front panel.

"External Trigger 2"
Trigger signal from the TRIGGER INPUT/OUTPUT connector on the front panel.
Note: Connector must be configured for "Input" in the "Outputs" configuration (see "Trigger 2/3" on page 70).

"External Trigger 3"
Trigger signal from the TRIGGER 3 INPUT/ OUTPUT connector on the rear panel.
Note: Connector must be configured for "Input" in the "Outputs" configuration (see "Trigger 2/3" on page 70).

Remote command:
`TRIG:SOUR EXT`, `TRIG:SOUR EXT2`, `TRIG:SOUR EXT3`
See `TRIGger[:SEQuence]:SOURce` on page 178

Digital I/Q ← Trigger Source ← Trigger Source
For applications that process I/Q data, such as the I/Q Analyzer or optional applications, and only if the Digital Baseband Interface (R&S FSW-B17) is available:

Defines triggering of the measurement directly via the LVDS connector. In the selection list you must specify which general purpose bit (GP0 to GP5) will provide the trigger data.

The following table describes the assignment of the general purpose bits to the LVDS connector pins.

(For details on the LVDS connector see the R&S FSW I/Q Analyzer User Manual.)

Table 6-2: Assignment of general purpose bits to LVDS connector pins

Bit	LVDS pin
GP0	SDATA4_P - Trigger1
GP1	SDATA4_P - Trigger2
GP2	SDATA0_P - Reserve1
GP3	SDATA4_P - Reserve2
GP4	SDATA0_P - Marker1
GP5	SDATA4_P - Marker2

Remote command:
`TRIG:SOUR GP0`, see `TRIGger[:SEQuence]:SOURce` on page 178

IF Power ← Trigger Source ← Trigger Source
The R&S FSW starts capturing data as soon as the trigger threshold is exceeded around the third intermediate frequency.

This trigger source is available for frequency and time domain measurements only.

It is not available for input from the Digital Baseband Interface (R&S FSW-B17) or the Analog Baseband Interface (R&S FSW-B71).

For frequency sweeps, the third IF represents the start frequency. The trigger bandwidth at the third IF depends on the RBW and sweep type.

For measurements on a fixed frequency (e.g. zero span or I/Q measurements), the third IF represents the center frequency.

The trigger threshold depends on the defined trigger level, as well as on the RF attenuation and preamplification. For details on available trigger levels and trigger bandwidths see the data sheet.

This trigger source is only available for RF input.

Remote command:
`TRIG:SOUR IFP`, see `TRIGger[:SEQuence]:SOURce` on page 178

Trigger Level ← Trigger Source
Defines the trigger level for the specified trigger source.

For details on supported trigger levels, see the data sheet.

Remote command:
TRIGger[:SEQuence]:LEVel[:EXTernal<port>] on page 176
For analog baseband (B71) or digital baseband (B17) input only:
TRIGger[:SEQuence]:LEVel:BBPower on page 176

Drop-Out Time ← Trigger Source
Defines the time the input signal must stay below the trigger level before triggering again.

Note: For input from the Analog Baseband Interface (R&S FSW-B71) using the baseband power trigger (BBP), the default drop out time is set to 100 ns to avoid unintentional trigger events (as no hysteresis can be configured in this case).

Remote command:
TRIGger[:SEQuence]:DTIMe on page 174

Trigger Offset ← Trigger Source
Defines the time offset between the trigger event and the start of the sweep.

offset > 0:	Start of the sweep is delayed
offset < 0:	Sweep starts earlier (pre-trigger)

Remote command:
TRIGger[:SEQuence]:HOLDoff[:TIME] on page 175

Hysteresis ← Trigger Source
Defines the distance in dB to the trigger level that the trigger source must exceed before a trigger event occurs. Settting a hysteresis avoids unwanted trigger events caused by noise oscillation around the trigger level.

This setting is only available for "IF Power" trigger sources. The range of the value is between 3 dB and 50 dB with a step width of 1 dB.

This setting is available for frequency and time domain measurements only.

Remote command:
TRIGger[:SEQuence]:IFPower:HYSTeresis on page 175

Trigger Holdoff ← Trigger Source
Defines the minimum time (in seconds) that must pass between two trigger events. Trigger events that occur during the holdoff time are ignored.

Remote command:
TRIGger[:SEQuence]:IFPower:HOLDoff on page 175

Slope ← Trigger Source
For all trigger sources except time you can define whether triggering occurs when the signal rises to the trigger level or falls down to it.

Remote command:
TRIGger[:SEQuence]:SLOPe on page 177

Capture Offset ← Trigger Source
This setting is only available for applications in **MSRA operating mode**. It has a similar effect as the trigger offset in other measurements: it defines the time offset between the capture buffer start and the start of the extracted application data. The offset must be a positive value, as the application can only analyze data that is contained in the capture buffer.

Remote command:
`[SENSe:]MSRA:CAPTure:OFFSet` on page 248

Trigger 2/3
Defines the usage of the variable TRIGGER INPUT/OUTPUT connectors, where:

"Trigger 2": TRIGGER INPUT/OUTPUT connector on the front panel

"Trigger 3": TRIGGER 3 INPUT/ OUTPUT connector on the rear panel

(Trigger 1 is INPUT only.)

Note: Providing trigger signals as output is described in detail in the R&S FSW User Manual.

"Input" The signal at the connector is used as an external trigger source by the R&S FSW. No further trigger parameters are available for the connector.

"Output" The R&S FSW sends a trigger signal to the output connector to be used by connected devices.
Further trigger parameters are available for the connector.

Remote command:
`OUTPut:TRIGger<port>:LEVel` on page 181
`OUTPut:TRIGger<port>:DIRection` on page 180

Output Type ← Trigger 2/3
Type of signal to be sent to the output

"Device Triggered" (Default) Sends a trigger when the R&S FSW triggers.

"Trigger Armed" Sends a (high level) trigger when the R&S FSW is in "Ready for trigger" state.
This state is indicated by a status bit in the `STATus:OPERation` register (bit 5), as well as by a low level signal at the AUX port (pin 9).

"User Defined" Sends a trigger when user selects "Send Trigger" button.
In this case, further parameters are available for the output signal.

Remote command:
`OUTPut:TRIGger<port>:OTYPe` on page 181

Level ← Output Type ← Trigger 2/3
Defines whether a constant high (1) or low (0) signal is sent to the output connector.

Remote command:
`OUTPut:TRIGger<port>:LEVel` on page 181

Pulse Length ← Output Type ← Trigger 2/3
Defines the length of the pulse sent as a trigger to the output connector.

Remote command:
`OUTPut:TRIGger<port>:PULSe:LENGth` on page 182

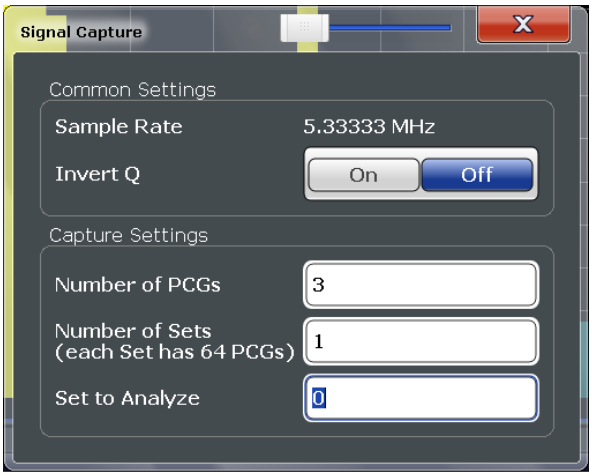
Send Trigger ← Output Type ← Trigger 2/3
Sends a user-defined trigger to the output connector immediately. Note that the trigger pulse level is always opposite to the constant signal level defined by the output "Level" setting, e.g. for "Level = High", a constant high signal is output to the connector until the "Send Trigger" button is selected. Then, a low pulse is sent.

Which pulse level will be sent is indicated by a graphic on the button.

Remote command:
`OUTPut:TRIGger<port>:PULSe:IMMediate` on page 181

6.2.7 Signal Capture (Data Acquisition)

You must define how much and how data is captured from the input signal.



MSRA operating mode
In MSRA operating mode, only the MSRA Master channel actually captures data from the input signal. The data acquisition settings for the CDMA2000 BTS application in MSRA mode define the **application data** (see chapter 6.2.8, "Application Data (MSRA)", on page 88).

For details on the MSRA operating mode see the R&S FSW MSRA User Manual.

Sample Rate....88
Invert Q....88
Number of PCGs....88
Number of Sets....88
Set to Analyze....88

Sample Rate
The sample rate is always 5.33333 MHz (indicated for reference only).

Invert Q
Inverts the sign of the signal's Q-branch. The default setting is OFF.

Remote command:
`[SENSe:]CDPower:QINVert` on page 183

Number of PCGs
Sets the number of PCGs you want to analyze. The input value is always in multiples of the PCGs. The maximum capture length is 64. The default value is 3.

If the "Number of Sets" on page 88 to capture is larger than 1, the number of PCGs is always 64.

For more information on PCGs and sets see chapter 4.1, "PCGs and Sets", on page 36.

Remote command:
`[SENSe:]CDPower:IQLength` on page 182

Number of Sets
Defines the number of consecutive sets to be captured and stored in the instrument's IQ memory. The possible value range is from 1 to a maximum of 1500 (BTS application) or 810 (MS application) sets.

The default setting is 1.

If you capture more than one set, the number of slots/PCGs is always 64 (CDMA2000 BTS application: 32) and is not available for modification.

Remote command:
`[SENSe:]CDPower:SET:COUNt` on page 183

Set to Analyze
Selects a specific set for further analysis. The value range is between 0 and "Number of Sets" on page 88 – 1.

Remote command:
`[SENSe:]CDPower:SET` on page 195

6.2.8 Application Data (MSRA)

For the CDMA2000 BTS application in MSRA operating mode, the application data range is defined by the same settings used to define the signal capturing in Signal and Spectrum Analyzer mode (see "Number of Sets" on page 88).

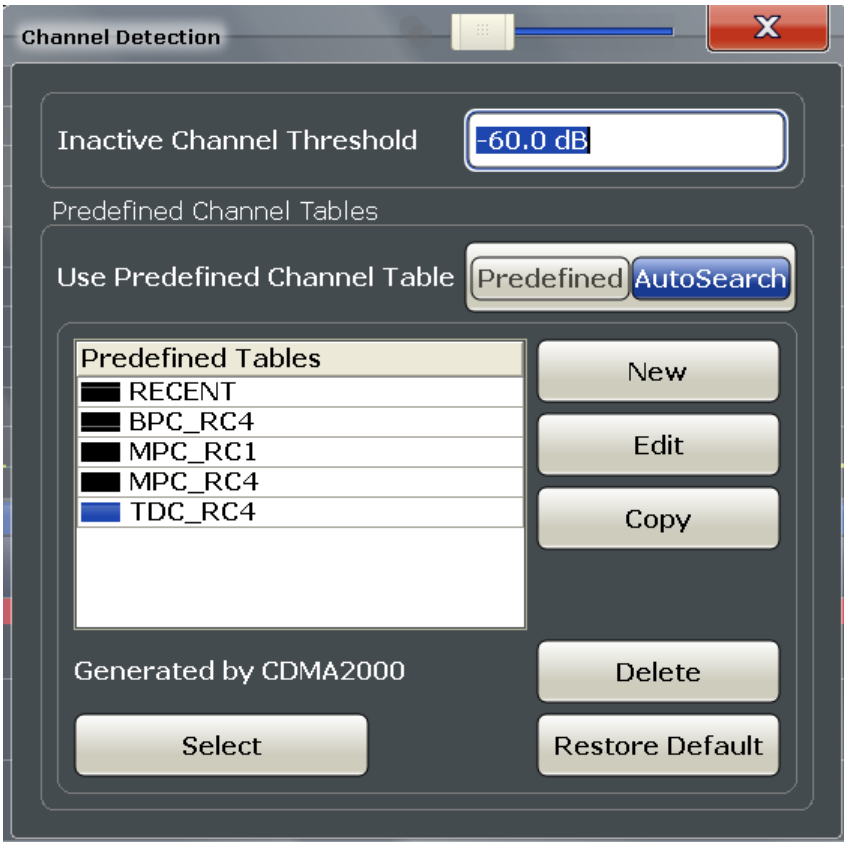
In addition, a capture offset can be defined, i.e. an offset from the start of the captured data to the start of the analysis interval for the CDMA2000 BTS measurement (see "Capture Offset" on page 86).

The **analysis interval** cannot be edited manually, but is determined automatically according to the selected PCG, code or set to analyze which is defined for the evaluation

range, depending on the result display. Note that the PCG/code/set is analyzed *within the application data*.

6.2.9 Channel Detection

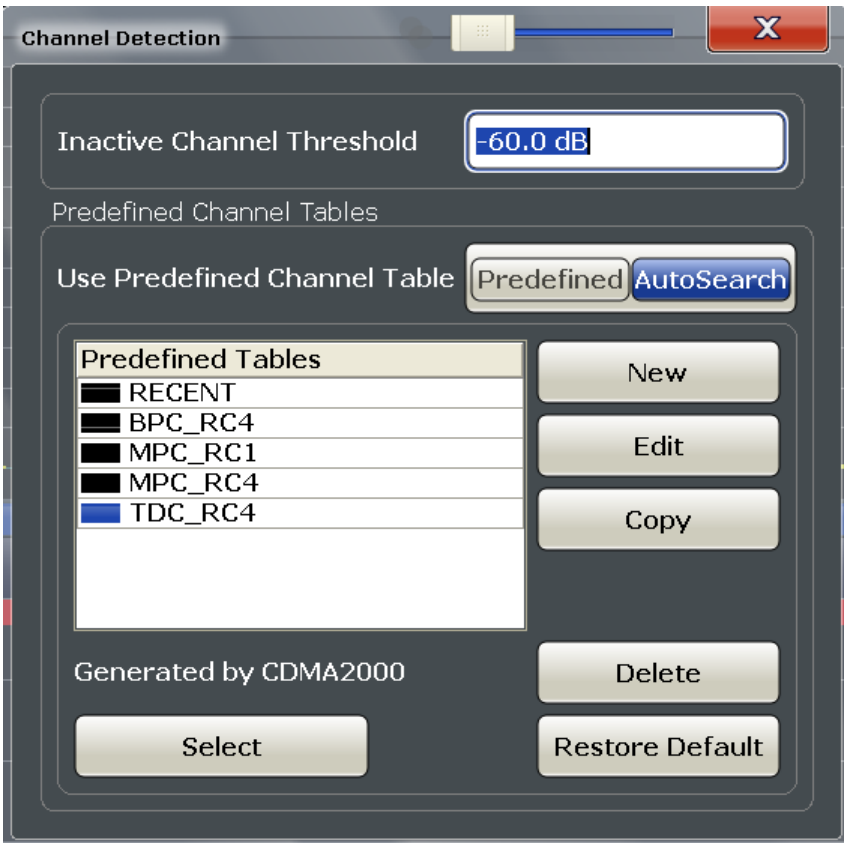
The channel detection settings determine which channels are found in the input signal.



- General Channel Detection Settings....89
- Channel Table Management....91
- Channel Table Settings and Functions....92
- BTS Channel Details....93
- MS Channel Details....95

6.2.9.1 General Channel Detection Settings

Channel detection settings are configured in the "Channel Detection" dialog box which is displayed when you select the "Channel Detection" button in the configuration "Overview".



Inactive Channel Threshold....90
Using Predefined Channel Tables....90

Inactive Channel Threshold
Defines the minimum power that a single channel must have compared to the total signal in order to be recognized as an active channel.

The default value is -60 dB. With this value all channels with signals such as the CDMA2000 test models are detected by the Code Domain Power analysis. Decrease the Inactive Channel Threshold value, if not all channels contained in the signal are detected.

Remote command:
`[SENSe:]CDPower:ICTReshold` on page 185

Using Predefined Channel Tables
Defines the channel search mode.

"Predefined" Compares the input signal to the predefined channel table selected in the "Predefined Tables" list

"Auto" Detects channels automatically using pilot sequences and fixed code numbers
The automatic search provides an overview of the channels contained in the currently measured signal. If channels are not detected as being active, change the Inactive Channel Threshold or select the "Predefined" channel search mode.

Remote command:
`CONFigure:CDPower[:BTS]:CTABle[:STATe]` on page 187

6.2.9.2 Channel Table Management

Channel tables are managed in the "Channel Detection" dialog box which is displayed when you select the "Channel Detection" button in the configuration "Overview".

Predefined Tables....91
Selecting a Table....91
Creating a New Table....92
Editing a Table....92
Copying a Table....92
Deleting a Table....92
Restoring Default Tables....92

Predefined Tables
The list shows all available channel tables and marks the currently used table with a checkmark. The currently *focussed* table is highlighted blue.

For details on predefined channel tables provided by the CDMA2000 applications see chapter A.1, "Reference: Predefined Channel Tables", on page 253.

The following channel tables are available by default:

"RECENT"
Contains the most recently selected channel table

"BPC_RC4, MPC_RC1, MPC_RC4, TDC_RC4"
Channel tables for BTS measurements; configured according to a specific radio configuration

"EACHOP, RCCCHOP, RTCHOP3, RTCHOP5"
Channel tables for MS mode; configured according to a specific radio configuration

Remote command:
`CONFigure:CDPower[:BTS]:CTABle:CATalog?` on page 185

Selecting a Table
Selects the channel table currently focussed in the "Predefined Tables" list and compares it to the measured signal to detect channels.

Remote command:
`CONFigure:CDPower[:BTS]:CTABle:SELect` on page 187

Creating a New Table
Creates a new channel table. For a description of channel table settings and functions see chapter 6.2.9.3, "Channel Table Settings and Functions", on page 92.

For step-by-step instructions on creating a new channel table, see "To define or edit a channel table" on page 121.

Remote command:
`CONFigure:CDPower[:BTS]:CTABle:NAME` on page 191

Editing a Table
You can edit existing channel table definitions. The details of the selected channel are displayed in the "Channel Table" dialog box.

Copying a Table
Copies an existing channel table definition. The details of the selected channel are displayed in the "Channel Table" dialog box.

Remote command:
`CONFigure:CDPower[:BTS]:CTABle:COPY` on page 186

Deleting a Table
Deletes the currently selected channel table after a message is confirmed.

Remote command:
`CONFigure:CDPower[:BTS]:CTABle:DELete` on page 187

Restoring Default Tables
Restores the predefined channel tables delivered with the instrument.

Remote command:
`CONFigure:CDPower[:BTS]:CTABle:RESTore` on page 187

6.2.9.3 Channel Table Settings and Functions

Some general settings and functions are available when configuring a predefined channel table.

Channel tables are configured in the "Channel Table" dialog box which is displayed when you select the "New", "Copy" or "Edit" buttons for a predefined channel table in the "Channel Detection" dialog box.

For details on channel table entries see chapter 6.2.9.4, "BTS Channel Details", on page 93 or chapter 6.2.9.5, "MS Channel Details", on page 95.

Name....93
Comment....93
Adding a Channel....93
Deleting a Channel....93
Creating a New Channel Table from the Measured Signal (Measure Table)....93

Sorting the Table....93
Cancelling the Configuration....93
Saving the Table....93

Name
Name of the channel table that will be displayed in the "Predefined Channel Tables" list.

Remote command:
`CONFigure:CDPower[:BTS]:CTABle:NAME` on page 191

Comment
Optional description of the channel table.

Remote command:
`CONFigure:CDPower[:BTS]:CTABle:COMMent` on page 188

Adding a Channel
Inserts a new row in the channel table to define another channel.

Deleting a Channel
Deletes the currently selected channel from the table.

Creating a New Channel Table from the Measured Signal (Measure Table)
Creates a completely new channel table according to the current measurement data.

Remote command:
`CONFigure:CDPower[:BTS]:MEASurement` on page 142

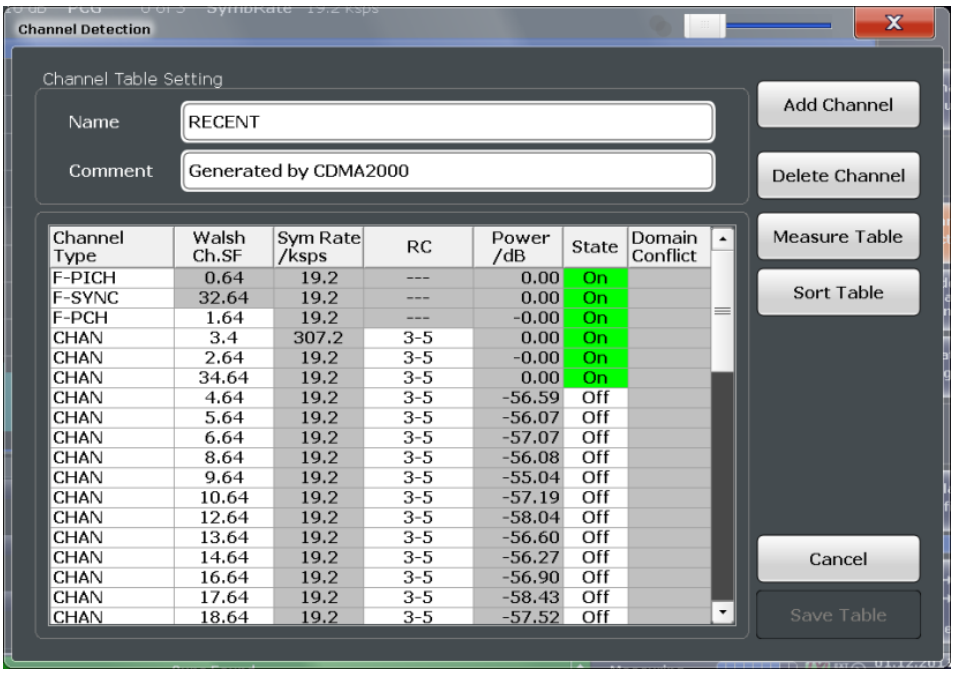
Sorting the Table
Sorts the channel table entries.

Cancelling the Configuration
Closes the "Channel Table" dialog box without saving the changes.

Saving the Table
Saves the changes to the table and closes the "Channel Table" dialog box.

6.2.9.4 BTS Channel Details

Channel details are configured in the "Channel Table" dialog box which is displayed when you select the "New", "Copy" or "Edit" buttons for a predefined channel table in the "Channel Detection" dialog box.


Channel Detection
Channel Table Setting
Name
RECENT
Comment
Generated by CDMA2000
Add Channel
Delete Channel
Measure Table
Sort Table
Cancel
Save Table
Channel Type | Walsh Ch.SF | Sym Rate /ksps | RC | Power /dB | State | Domain Conflict
F-PICH | 0.64 | 19.2 | --- | 0.00 | On
F-SYNC | 32.64 | 19.2 | --- | 0.00 | On
F-PCH | 1.64 | 19.2 | --- | -0.00 | On
CHAN | 3.4 | 307.2 | 3-5 | 0.00 | On
CHAN | 2.64 | 19.2 | 3-5 | -0.00 | On
CHAN | 34.64 | 19.2 | 3-5 | 0.00 | On
CHAN | 4.64 | 19.2 | 3-5 | -56.59 | Off
CHAN | 5.64 | 19.2 | 3-5 | -56.07 | Off
CHAN | 6.64 | 19.2 | 3-5 | -57.07 | Off
CHAN | 8.64 | 19.2 | 3-5 | -56.08 | Off
CHAN | 9.64 | 19.2 | 3-5 | -55.04 | Off
CHAN | 10.64 | 19.2 | 3-5 | -57.19 | Off
CHAN | 12.64 | 19.2 | 3-5 | -58.04 | Off
CHAN | 13.64 | 19.2 | 3-5 | -56.60 | Off
CHAN | 14.64 | 19.2 | 3-5 | -56.27 | Off
CHAN | 16.64 | 19.2 | 3-5 | -56.90 | Off
CHAN | 17.64 | 19.2 | 3-5 | -58.43 | Off
CHAN | 18.64 | 19.2 | 3-5 | -57.52 | Off

Channel Type....94
Channel Number (Ch. SF)....94
Symbol Rate....94
RC....95
Power....95
Status....95
Domain Conflict....95

Channel Type
Type of channel according to CDMA2000 standard.

For a list of possible channel types see chapter 4.8.1, "BTS Channel Types", on page 43 or chapter 4.8.2, "MS Channel Types", on page 44.

Remote command:
BTS application:
`CONFigure:CDPower[:BTS]:CTABle:DATA` on page 188
MS application:
`CONFigure:CDPower[:BTS]:CTABle:DATA` on page 190

Channel Number (Ch. SF)
Number of channel spreading code (0 to [spreading factor-1])

Remote command:
BTS application:
`CONFigure:CDPower[:BTS]:CTABle:DATA` on page 188
MS application:
`CONFigure:CDPower[:BTS]:CTABle:DATA` on page 190

Symbol Rate
Symbol rate at which the channel is transmitted.

RC
The Radio Configuration (RC) can be customized for two channel types. For the PDCH you can set the configuration to either 10 (QPSK), 10 (8PSK) or 10 (16QAM). For CHAN channels, you can set the radio configuration to 1-2 or 3-5.

For details on radio configurations see chapter 4.6, "Radio Configuration", on page 41.

Power
Contains the measured relative code domain power. The unit is dB. The fields are filled with values after you press the "Meas" button (see "Creating a New Channel Table from the Measured Signal (Measure Table)" on page 93).

Remote command:
BTS application:
`CONFigure:CDPower[:BTS]:CTABle:DATA` on page 188
MS application:
`CONFigure:CDPower[:BTS]:CTABle:DATA` on page 190

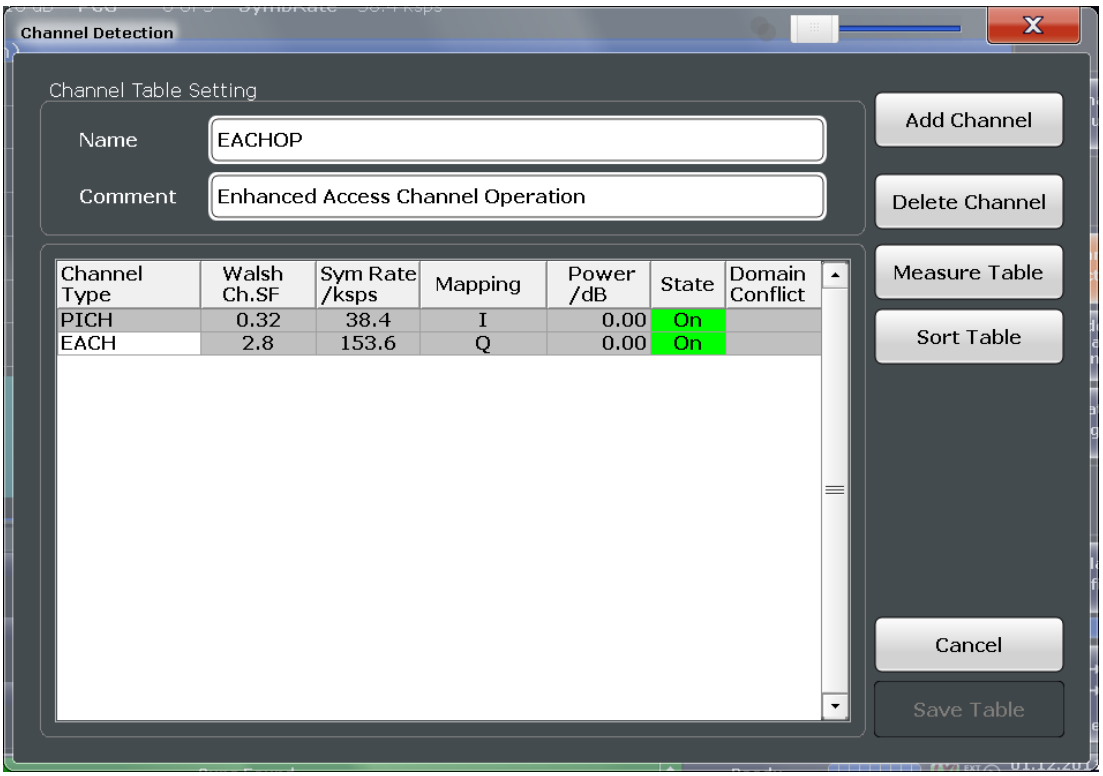
Status
Indicates the channel status. Codes that are not assigned are marked as inactive channels.

Remote command:
BTS application:
`CONFigure:CDPower[:BTS]:CTABle:DATA` on page 188
MS application:
`CONFigure:CDPower[:BTS]:CTABle:DATA` on page 190

Domain Conflict
Indicates a code domain conflict between channel definitions (e.g. overlapping channels).

6.2.9.5 MS Channel Details

Channel details are configured in the "Channel Table" dialog box which is displayed when you select the "New", "Copy" or "Edit" buttons for a predefined channel table in the "Channel Detection" dialog box.



Channel Type....96
Channel Number (Ch. SF)....96
Symbol Rate....97
Mapping....97
Power....97
Status....97
Domain Conflict....97

Channel Type
Type of channel according to CDMA2000 standard.

For a list of possible channel types see chapter 4.8.1, "BTS Channel Types", on page 43 or chapter 4.8.2, "MS Channel Types", on page 44.

Remote command:
BTS application:
`CONFigure:CDPower[:BTS]:CTABle:DATA` on page 188
MS application:
`CONFigure:CDPower[:BTS]:CTABle:DATA` on page 190

Channel Number (Ch. SF)
Number of channel spreading code (0 to [spreading factor-1])

Remote command:
BTS application:
`CONFigure:CDPower[:BTS]:CTABle:DATA` on page 188
MS application:
`CONFigure:CDPower[:BTS]:CTABle:DATA` on page 190

Symbol Rate
Symbol rate at which the channel is transmitted.

Mapping
Branch onto which the channel is mapped (I or Q). The setting is not editable, since the standard specifies the channel assignment for each channel.

For more information see chapter 4.5, "Code Mapping and Branches", on page 40.

Remote command:
`[SENSe:]CDPower:MAPPing` on page 195

Power
Contains the measured relative code domain power. The unit is dB. The fields are filled with values after you press the "Meas" button (see "Creating a New Channel Table from the Measured Signal (Measure Table)" on page 93).

Remote command:
BTS application:
`CONFigure:CDPower[:BTS]:CTABle:DATA` on page 188
MS application:
`CONFigure:CDPower[:BTS]:CTABle:DATA` on page 190

Status
Indicates the channel status. Codes that are not assigned are marked as inactive channels.

Remote command:
BTS application:
`CONFigure:CDPower[:BTS]:CTABle:DATA` on page 188
MS application:
`CONFigure:CDPower[:BTS]:CTABle:DATA` on page 190

Domain Conflict
Indicates a code domain conflict between channel definitions (e.g. overlapping channels).

6.2.10 Sweep Settings

The sweep settings define how the data is measured.

Sweep/Average Count....97
Continuous Sweep/RUN CONT....98
Single Sweep/ RUN SINGLE....98
Continue Single Sweep....98

Sweep/Average Count
Defines the number of sweeps to be performed in the single sweep mode. Values from 0 to 200000 are allowed. If the values 0 or 1 are set, one sweep is performed. The sweep count is applied to all the traces in all diagrams.

If the trace configurations "Average", "Max Hold" or "Min Hold" are set, this value also determines the number of averaging or maximum search procedures.

In continuous sweep mode, if sweep count = 0 (default), averaging is performed over 10 sweeps. For sweep count =1, no averaging, maxhold or minhold operations are performed.

Remote command:
`[SENSe:]SWEep:COUNt` on page 191
`[SENSe:]AVERage:COUNt` on page 191

Continuous Sweep/RUN CONT
After triggering, starts the sweep and repeats it continuously until stopped. This is the default setting.

While the measurement is running, the "Continuous Sweep" softkey and the RUN CONT key are highlighted. The running measurement can be aborted by selecting the highlighted softkey or key again. The results are not deleted until a new measurement is started.

Note: Sequencer. If the Sequencer is active, the "Continuous Sweep" softkey only controls the sweep mode for the currently selected channel; however, the sweep mode only has an effect the next time the Sequencer activates that channel, and only for a channel-defined sequence. In this case, a channel in continuous sweep mode is swept repeatedly. Furthermore, the RUN CONT key on the front panel controls the Sequencer, not individual sweeps. RUN CONT starts the Sequencer in continuous mode.

For details on the Sequencer, see the R&S FSW User Manual.

Remote command:
`INITiate:CONTinuous` on page 211

Single Sweep/ RUN SINGLE
After triggering, starts the number of sweeps set in "Sweep Count". The measurement stops after the defined number of sweeps has been performed.

While the measurement is running, the "Single Sweep" softkey and the RUN SINGLE key are highlighted. The running measurement can be aborted by selecting the highlighted softkey or key again.

Note: Sequencer. If the Sequencer is active, the "Single Sweep" softkey only controls the sweep mode for the currently selected channel; however, the sweep mode only has an effect the next time the Sequencer activates that channel, and only for a channel-defined sequence. In this case, a channel in single sweep mode is swept only once by the Sequencer.
Furthermore, the RUN SINGLE key on the front panel controls the Sequencer, not individual sweeps. RUN SINGLE starts the Sequencer in single mode.

If the Sequencer is off, only the evaluation for the currently displayed measurement channel is updated.

Remote command:
`INITiate[:IMMediate]` on page 211

Continue Single Sweep
After triggering, repeats the number of sweeps set in "Sweep Count", without deleting the trace of the last measurement.

While the measurement is running, the "Continue Single Sweep" softkey and the RUN SINGLE key are highlighted. The running measurement can be aborted by selecting the highlighted softkey or key again.

Remote command:
`INITiate:CONMeas` on page 210

6.2.11 Automatic Settings

Some settings can be adjusted by the R&S FSW automatically according to the current measurement settings. In order to do so, a measurement is performed. The duration of this measurement can be defined automatically or manually.

To activate the automatic adjustment of a setting, select the corresponding function in the AUTO SET menu or in the configuration dialog box for the setting, where available.

MSRA operating mode

In MSRA operating mode, the following automatic settings are not available, as they require a new data acquisition. However, CDMA2000 applications cannot perform data acquisition in MSRA operating mode.

Adjusting all Determinable Settings Automatically (Auto All).....99
Setting the Reference Level Automatically (Auto Level).....99
Auto Scale Window.....100
Auto Scale All.....100
Resetting the Automatic Measurement Time (Meastime Auto).....100
Changing the Automatic Measurement Time (Meastime Manual).....100
Upper Level Hysteresis.....100
Lower Level Hysteresis.....100

Adjusting all Determinable Settings Automatically (Auto All)
Activates all automatic adjustment functions for the current measurement settings.

This includes:

- Auto Level
- "Auto Scale All" on page 100

Remote command:
`[SENSe:]ADJust:ALL` on page 192

Setting the Reference Level Automatically (Auto Level)
Automatically determines the optimal reference level for the current input data. At the same time, the internal attenuators and the preamplifier (for analog baseband input: the fullscale level) are adjusted so the signal-to-noise ratio is optimized, while signal compression, clipping and overload conditions are minimized.

In order to do so, a level measurement is performed to determine the optimal reference level.

You can change the measurement time for the level measurement if necessary (see "Changing the Automatic Measurement Time (Meastime Manual)" on page 100).

Remote command:
[SENSe:]ADJust:LEVel on page 194

Auto Scale Window
Automatically determines the optimal range and reference level position to be displayed for the *current* measurement settings in the currently selected window. No new measurement is performed.

Auto Scale All
Automatically determines the optimal range and reference level position to be displayed for the *current* measurement settings in all displayed diagrams. No new measurement is performed.

Resetting the Automatic Measurement Time (Meastime Auto)
Resets the measurement duration for automatic settings to the default value.

Remote command:
[SENSe:]ADJust:CONFigure:DURation:MODE on page 193

Changing the Automatic Measurement Time (Meastime Manual)
This function allows you to change the measurement duration for automatic setting adjustments. Enter the value in seconds.

Remote command:
[SENSe:]ADJust:CONFigure:DURation:MODE on page 193
[SENSe:]ADJust:CONFigure:DURation on page 193

Upper Level Hysteresis
When the reference level is adjusted automatically using the Auto Level function, the internal attenuators and the preamplifier are also adjusted. In order to avoid frequent adaptation due to small changes in the input signal, you can define a hysteresis. This setting defines an upper threshold the signal must exceed (compared to the last measurement) before the reference level is adapted automatically.

Remote command:
[SENSe:]ADJust:CONFigure:HYSTeresis:UPPer on page 194

Lower Level Hysteresis
When the reference level is adjusted automatically using the Auto Level function, the internal attenuators and the preamplifier are also adjusted. In order to avoid frequent adaptation due to small changes in the input signal, you can define a hysteresis. This setting defines a lower threshold the signal must fall below (compared to the last measurement) before the reference level is adapted automatically.

Remote command:
[SENSe:]ADJust:CONFigure:HYSTeresis:LOWer on page 194

6.2.12 Zoom Functions

The zoom functions are only available from the toolbar.

Single Zoom....101
Multiple Zoom....101
Restore Original Display....101
Deactivating Zoom (Selection mode)....101

Single Zoom

A single zoom replaces the current diagram by a new diagram which displays an enlarged extract of the trace. This function can be used repetitively until the required details are visible.

Remote command:
`DISPlay[:WINDow<n>]:ZOOM:STATe` on page 208
`DISPlay[:WINDow<n>]:ZOOM:AREA` on page 207

Multiple Zoom

In multiple zoom mode, you can enlarge several different areas of the trace simultaneously. An overview window indicates the zoom areas in the original trace, while the zoomed trace areas are displayed in individual windows. The zoom area that corresponds to the individual zoom display is indicated in the lower right corner, between the scrollbars.

Remote command:
`DISPlay[:WINDow<n>]:ZOOM:MULTiple<zoom>:STATe` on page 209
`DISPlay[:WINDow<n>]:ZOOM:MULTiple<zoom>:AREA` on page 208

Restore Original Display

Restores the original display and closes all zoom windows.

Remote command:
`DISPlay[:WINDow<n>]:ZOOM:STATe` on page 208 (single zoom)
`DISPlay[:WINDow<n>]:ZOOM:MULTiple<zoom>:STATe` on page 209 (for each multiple zoom window)

Deactivating Zoom (Selection mode)

Deactivates zoom mode; tapping the screen no longer invokes a zoom, but selects an object.

Remote command:
`DISPlay[:WINDow<n>]:ZOOM:STATe` on page 208 (single zoom)
`DISPlay[:WINDow<n>]:ZOOM:MULTiple<zoom>:STATe` on page 209 (for each multiple zoom window)

6.3 RF Measurements

CDMA2000 measurements require a special application on the R&S FSW, which you activate using the MODE key on the front panel.

When you activate a CDMA2000 application, Code Domain Analysis of the input signal is started automatically. However, the CDMA2000 applications also provide various RF measurement types.

Selecting the measurement type

► To seler konnte sich ect an RF measurement type, do one of the following:

- Tap the "Overview" softkey. In the "Overview", tap the "Select Measurement" button. Select the required measurement.
- Press the MEAS key on the front panel. In the "Select Measurement" dialog box, select the required measurement.

Some parameters are set automatically according to the CDMA2000 standard the first time a measurement is selected (since the last PRESET operation). A list of these parameters is given with each measurement type. The parameters can be changed, but are not reset automatically the next time you re-enter the measurement.

The main measurement configuration menus for the RF measurements are identical to the Spectrum application.

For details refer to "Measurements" in the R&S FSW User Manual.

The measurement-specific settings for the following measurements are available via the "Overview".

- Signal Channel Power Measurements.....102
- Channel Power (ACLR) Measurements.....103
- Spectrum Emission Mask.....104
- Occupied Bandwidth.....105
- CCDF.....106

6.3.1 Signal Channel Power Measurements

The Power measurement determines the CDMA2000 signal channel power.

To do so, the RF signal power of a single channel is analyzed with 1.2288 MHz bandwidth over a single trace. The displayed results are based on the root mean square. The bandwidth and the associated channel power are displayed in the Result Summary.

In order to determine the signal channel power, the CDMA2000 application performs a Channel Power measurement as in the Spectrum application with the following settings:

Table 6-3: Predefined settings for CDMA2000 Output Channel Power measurements

Setting	Default Value
ACLR Standard	CDMA2000 MC1
Number of adjacent channels	0
Frequency Span	2 MHz

For further details about the Power measurement refer to "Channel Power and Adjacent-Channel Power (ACLR) Measurements" in the R&S FSW User Manual.

6.3.2 Channel Power (ACLR) Measurements

The Adjacent Channel Power measurement analyzes the power of the TX channel and the power of adjacent and alternate channels on the left and right side of the TX channel. The number of TX channels and adjacent channels can be modified as well as the band class. The bandwidth and power of the TX channel and the bandwidth, spacing and power of the adjacent and alternate channels are displayed in the Result Summary.

Channel Power ACLR measurements are performed as in the Spectrum application with the following predefined settings according to CDMA2000 specifications (adjacent channel leakage ratio).

Table 6-4: Predefined settings for CDMA2000 ACLR Channel Power measurements

Setting	Default value
Bandclass	0: 800 MHz Cellular
Number of adjacent channels	2

For further details about the ACLR measurements refer to "Measuring Channel Power and Adjacent-Channel Power" in the R&S FSW User Manual.

To restore adapted measurement parameters, the following parameters are saved on exiting and are restored on re-entering this measurement:

- Reference level and reference level offset
- RBW, VBW
- Sweep time
- Span
- Number of adjacent channels
- Fast ACLR mode

The main measurement menus for the RF measurements are identical to the Spectrum application. However, for ACLR and SEM measurements in CDMA2000 applications, an additional softkey is available to select the required bandclass.

Bandclass
The bandclass defines the frequency band used for ACLR and SEM measurements. It also determines the corresponding limits and ACLR channel settings according to the CDMA2000 standard.

For an overview of supported bandclasses and their usage see chapter A.3, "Reference: Supported Bandclasses", on page 259.

Remote command:
`CONFigure:CDPower[:BTS]:BCLass|BANDclass` on page 199

6.3.3 Spectrum Emission Mask

The Spectrum Emission Mask measurement shows the quality of the measured signal by comparing the power values in the frequency range near the carrier against a spectral mask that is defined by the CDMA2000 specifications. The limits depend on the selected bandclass. In this way, the performance of the DUT can be tested and the emissions and their distance to the limit be identified.

Note that the CDMA2000 standard does not distinguish between spurious and spectral emissions.

The Result Summary contains a peak list with the values for the largest spectral emissions including their frequency and power.

The CDMA2000 applications perform the SEM measurement as in the Spectrum application with the following settings:

Table 6-5: Predefined settings for CDMA2000 SEM measurements

Bandclass	0: 800 MHz Cellular
Span	-4 MHz to +1.98 MHz
Number of ranges	5
Fast SEM	ON
Sweep time	100 ms
Number of power classes	3
Power reference type	Channel power

For further details about the Spectrum Emission Mask measurements refer to "Spectrum Emission Mask Measurement" in the R&S FSW User Manual.

Changing the RBW and the VBW is restricted due to the definition of the limits by the standard.

To restore adapted measurement parameters, the following parameters are saved on exiting and are restored on re-entering this measurement:

- Reference level and reference level offset
- Sweep time
- Span

The main measurement menus for the RF measurements are identical to the Spectrum application. However, for ACLR and SEM measurements, an additional softkey is available to select the required bandclass.

Bandclass
The bandclass defines the frequency band used for ACLR and SEM measurements. It also determines the corresponding limits and ACLR channel settings according to the CDMA2000 standard.

For an overview of supported bandclasses and their usage see chapter A.3, "Reference: Supported Bandclasses", on page 259.

Remote command:
`CONFigure:CDPower[:BTS]:BCLass|BANDclass` on page 199

6.3.4 Occupied Bandwidth

The Occupied Bandwidth measurement is performed as in the Spectrum application with default settings.

Table 6-6: Predefined settings for CDMA2000 OBW measurements

Setting	Default value
% Power Bandwidth	99 %
Channel bandwidth	1.2288 MHz

The Occupied Bandwidth measurement determines the bandwidth that the signal occupies. The occupied bandwidth is defined as the bandwidth in which – in default settings - 99 % of the total signal power is to be found. The percentage of the signal power to be included in the bandwidth measurement can be changed.

For further details about the Occupied Bandwidth measurements refer to "Measuring the Occupied Bandwidth" in the R&S FSW User Manual.

To restore adapted measurement parameters, the following parameters are saved on exiting and are restored on re-entering this measurement:

- Reference level and reference level offset
- RBW, VBW
- Sweep time
- Span

6.3.5 CCDF

The CCDF measurement determines the distribution of the signal amplitudes (complementary cumulative distribution function). The CCDF and the Crest factor are displayed. For the purposes of this measurement, a signal section of user-definable length is recorded continuously in zero span, and the distribution of the signal amplitudes is evaluated.

The measurement is useful to determine errors of linear amplifiers. The crest factor is defined as the ratio of the peak power and the mean power. The Result Summary displays the number of included samples, the mean and peak power and the crest factor.

The CCDF measurement is performed as in the Spectrum application with the following settings:

Table 6-7: Predefined settings for CDMA2000 CCDF measurements

CCDF	Active on trace 1
Analysis bandwidth	10 MHz
Number of samples	62500
VBW	5 MHz

For further details about the CCDF measurements refer to "Statistical Measurements" in the R&S FSW User Manual.

To restore adapted measurement parameters, the following parameters are saved on exiting and are restored on re-entering this measurement:

- Reference level and reference level offset
- Analysis bandwidth
- Number of samples

7 Analysis

General result analysis settings concerning the evaluation range, trace, markers, etc. can be configured via the "Analysis" button in the "Overview".

The remote commands required to perform these tasks are described in chapter 11.10, "General Analysis", on page 236.

Analyzing RF Measurements

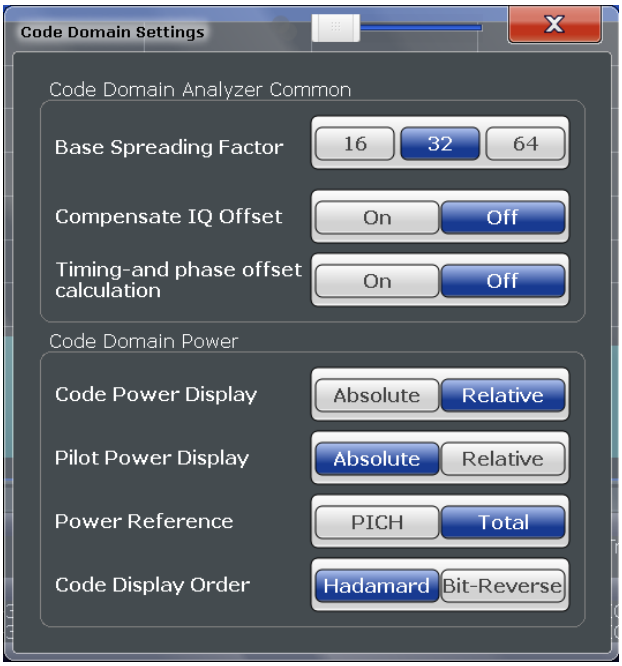
General result analysis settings concerning the trace, markers, lines etc. for RF measurements are identical to the analysis functions in the Spectrum application except for some special marker functions and spectrograms, which are not available in CDMA2000 applications.

For details see the "General Measurement Analysis and Display" chapter in the R&S FSW User Manual.

- Code Domain Analysis Settings....107
- Evaluation Range....109
- Traces....111
- Markers....112

7.1 Code Domain Analysis Settings

Some evaluations provide further settings for the results. The settings for CDA measurements are described here.



Base Spreading Factor....108
Compensate IQ Offset....108
Timing and phase offset calculation....108
Code Power Display....108
Pilot Power Display (MS application only)....108
Power Reference....108
Code Display Order....109

Base Spreading Factor
Changes the base spreading factor, which also changes the scale for code-based result displays. If you set the base spreading factor too low (e.g. to 64 for channels with a base spreading factor of 128 = code class 7), an alias power is displayed in the Code Domain Power and Code Domain Error Power diagrams.

For more information see chapter 4.3, "Code Display and Sort Order", on page 38.

Remote command:
`[SENSe:]CDPower:SFACtor` on page 198

Compensate IQ Offset
If enabled, the I/Q offset is eliminated from the measured signal. This is useful to deduct a DC offset to the baseband caused by the DUT, thus improving the EVM. Note, however, that for EVM measurements according to standard, compensation must be disabled.

Remote command:
`[SENSe:]CDPower:NORMalize` on page 196

Timing and phase offset calculation
Activates or deactivates the timing and phase offset calculation of the channels to the pilot channel. If deactivated, or if more than 50 active channels are in the signal, the calculation does not take place and dashes are displayed instead of values as results.

Remote command:
`[SENSe:]CDPower:TPMeas` on page 198

Code Power Display
For "Code Domain Power" evaluation:

Defines whether the absolute power or the power relative to the chosen reference (in BTS application: relative to total power) is displayed.

Remote command:
`[SENSe:]CDPower:PDISplay` on page 197

Pilot Power Display (MS application only)
For "Code Domain Power" evaluation in the MS application only:

Defines whether the absolute power or the power relative to the chosen reference is displayed for the pilot channel.

Remote command:
`[SENSe:]CDPower:PPReference` on page 197

Power Reference
For "Code Domain Power" evaluation in the MS application only:

Defines the reference for relative power display.

"Total" Relative to the total signal power

"PICH" Relative to the power of the PICH

Remote command:
`[SENSe:]CDPower:PREFerence` on page 198

Code Display Order
Defines the sorting of the channels for the Code Domain Power and Code Domain Error result displays.

For further details on the code order refer to chapter 4.3, "Code Display and Sort Order", on page 38 and chapter A.2, "Reference: Code Tables", on page 256.

"Hadamard" By default, the codes are sorted in Hadamard order, i.e. in ascending order.
The power of each code is displayed; there is no visible distinction between channels. If a channel covers several codes, the display shows the individual power of each code.

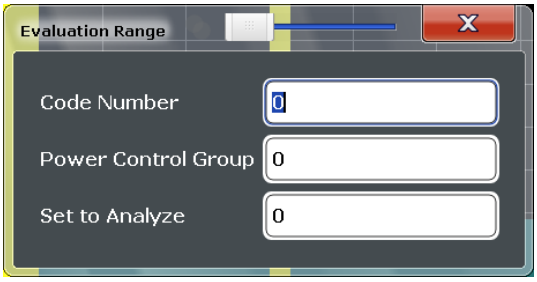
"Bit-Reverse" Bundles the channels with concentrated codes, i.e. all codes of a channel are next to one another. Thus you can see the total power of a concentrated channel.

Remote command:
`[SENSe:]CDPower:ORDer` on page 197

7.2 Evaluation Range

The evaluation range defines which channel (Code Number), PCG or set is analyzed in the result display.

For CDMA2000 MS measurements, the branch to be analyzed can also be defined.



Code Number....109
Power Control Group....110
Set to Analyze....110
Branch (MS application only)....110

Code Number
Selects a code for the following evaluations (see also chapter 3.1.2, "Evaluation Methods for Code Domain Analysis", on page 18):

- Bitstream
- Code Domain Power
- Code Domain Error Power
- Peak Code Domain Error
- Power vs PCG
- Power vs Symbol
- Result Summary
- Symbol Constellation
- Symbol EVM

The specified code is selected and marked in red.

For details on how specific codes are displayed see chapter 4.3, "Code Display and Sort Order", on page 38.

Remote command:
[SENSe:]CDPower:CODE on page 195

Power Control Group
Selects a PCG for the following evaluations:

- Bitstream
- Channel Table
- Code Domain Error Power
- Code Domain Power
- Composite Constellation
- Peak Code Domain Error
- Power vs PCG
- Power vs Symbol
- Result Summary
- Symbol Constellation
- Symbol EVM

Remote command:
[SENSe:]CDPower:SLOT on page 196

Set to Analyze
Selects a specific set for further analysis. The value range is between 0 and "Number of Sets" on page 88 – 1.

Remote command:
[SENSe:]CDPower:SET on page 195

Branch (MS application only)
Switches between the evaluation of the I and the Q branch in MS measurements.

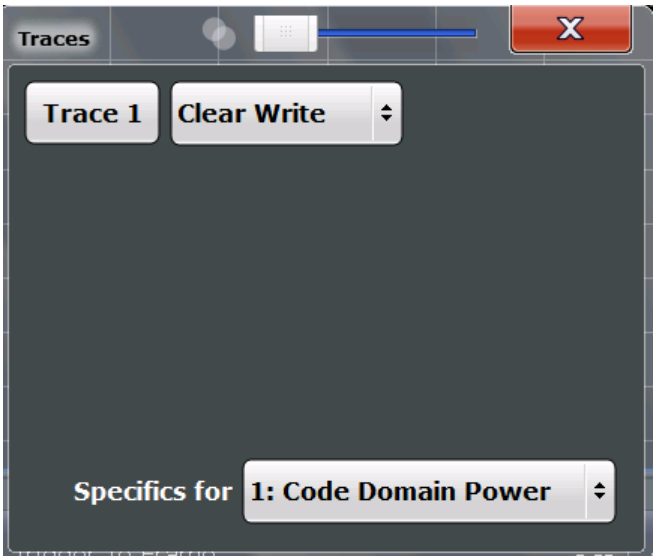
This affects the following evaluations:

- Code Domain Power
- Code Domain Error Power
- Peak Code Domain Error
- Power vs PCG
- Result Summary

Remote command:
[SENSe:]CDPower:MAPPing on page 195

7.3 Traces

The trace settings determine how the measured data is analyzed and displayed on the screen.



In CDA evaluations, only one trace can be active in each diagram at any time.

Window-specific configuration

The settings in this dialog box are specific to the selected window. To configure the settings for a different window, select the window outside the displayed dialog box, or select the window from the "Specifics for" selection list in the dialog box.

Trace Mode

Defines the update mode for subsequent traces.

"Clear Write" Overwrite mode: the trace is overwritten by each sweep. This is the default setting.
The "Detector" is automatically set to "Auto Peak".

"Max Hold" The maximum value is determined over several sweeps and displayed. The R&S FSW saves the sweep result in the trace memory only if the new value is greater than the previous one.
The "Detector" is automatically set to "Positive Peak".

"Min Hold" The minimum value is determined from several measurements and displayed. The R&S FSW saves the sweep result in the trace memory only if the new value is lower than the previous one.
The "Detector" is automatically set to "Negative Peak".

"Average" The average is formed over several sweeps.
The Sweep/Average Count determines the number of averaging procedures.
The "Detector" is automatically set to "Sample".

"View" The current contents of the trace memory are frozen and displayed.

"Blank" Removes the selected trace from the display.

Remote command:
`DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 237

7.4 Markers

Markers help you analyze your measurement results by determining particular values in the diagram. Thus you can extract numeric values from a graphical display.

Markers are configured in the "Marker" dialog box which is displayed when you do one of the following:

- In the "Overview", select "Analysis", and switch to the vertical "Marker" tab.
- Press the MKR key, then select the "Marker Config" softkey.

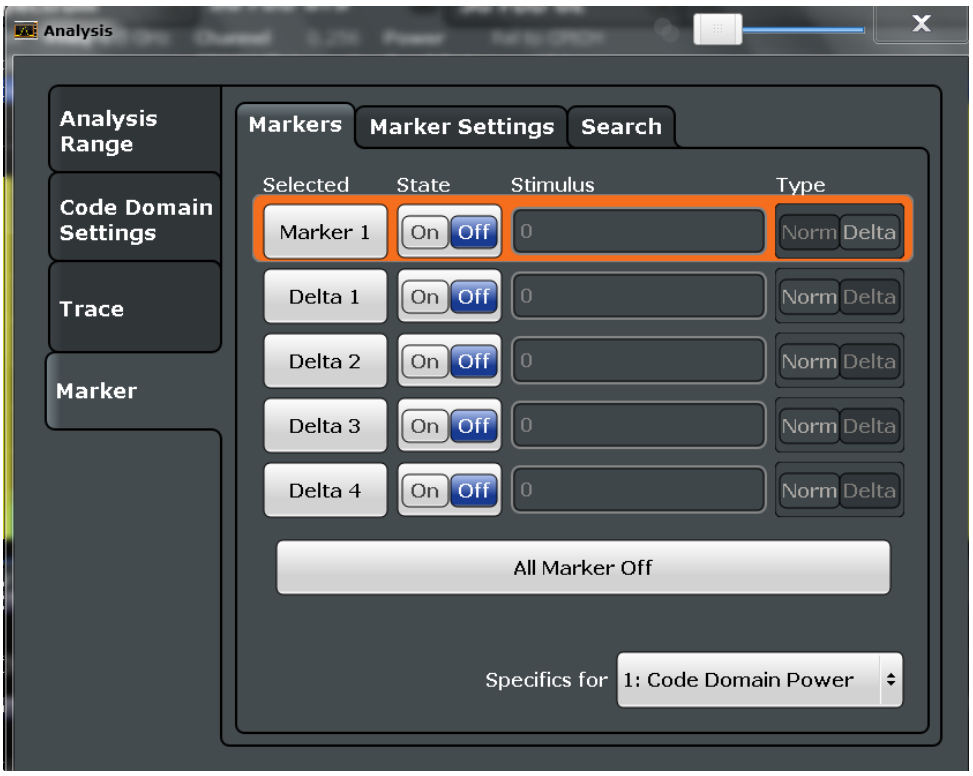
Markers in Code Domain Analysis measurements

In Code Domain Analysis measurements, the markers are set to individual symbols, codes, slots or channels, depending on the result display. Thus you can use the markers to identify individual codes, for example.

- Individual Marker Settings....112
- General Marker Settings....115
- Marker Search Settings....116
- Marker Positioning Functions....117

7.4.1 Individual Marker Settings

In CDA evaluations, up to 4 markers can be activated in each diagram at any time.



Select Marker....113
Selected Marker....114
Marker State....114
X-value....114
Marker Type....114
All Markers Off....115

Select Marker
Opens a dialog box to select and activate or deactivate one or more markers quickly.

Remote command:
Marker selected via suffix <m> in remote commands.

Selected Marker
Marker name. The marker which is currently selected for editing is highlighted orange.

Remote command:
Marker selected via suffix <m> in remote commands.

Marker State
Activates or deactivates the marker in the diagram.

Remote command:
`CALCulate<n>:MARKer<m>[:STATe]` on page 238
`CALCulate<n>:DELTamarker<m>[:STATe]` on page 239

X-value
Defines the position of the marker on the x-axis (channel, slot, symbol, depending on evaluation).

Remote command:
`CALCulate<n>:DELTamarker<m>:X` on page 240
`CALCulate<n>:MARKer<m>:X` on page 239

Marker Type
Toggles the marker type.

The type for marker 1 is always "Normal", the type for delta marker 1 is always "Delta". These types cannot be changed.

Note: If normal marker 1 is the active marker, switching the "Mkr Type" activates an additional delta marker 1. For any other marker, switching the marker type does not activate an additional marker, it only switches the type of the selected marker.

"Normal" A normal marker indicates the absolute value at the defined position in the diagram.

"Delta" A delta marker defines the value of the marker relative to the specified reference marker (marker 1 by default).

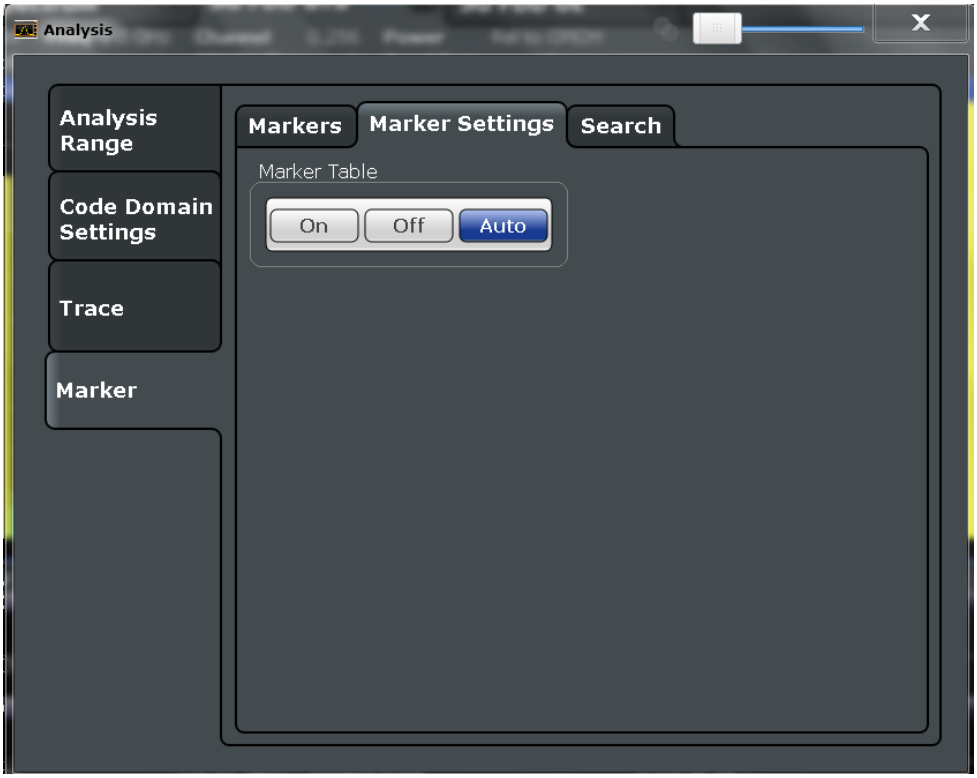
Remote command:
CALCulate<n>:MARKer<m>[:STATe] on page 238
CALCulate<n>:DELTamarker<m>[:STATe] on page 239

All Markers Off
Deactivates all markers in one step.

Remote command:
CALCulate<n>:MARKer<m>:AOFF on page 238

7.4.2 General Marker Settings

General marker settings are defined in the "Marker Config" tab of the "Marker" dialog box.



Marker Table Display
Defines how the marker information is displayed.

"On" Displays the marker information in a table in a separate area beneath the diagram.

"Off" Displays the marker information within the diagram area.

"Auto" (Default) Up to two markers are displayed in the diagram area. If more markers are active, the marker table is displayed automatically.

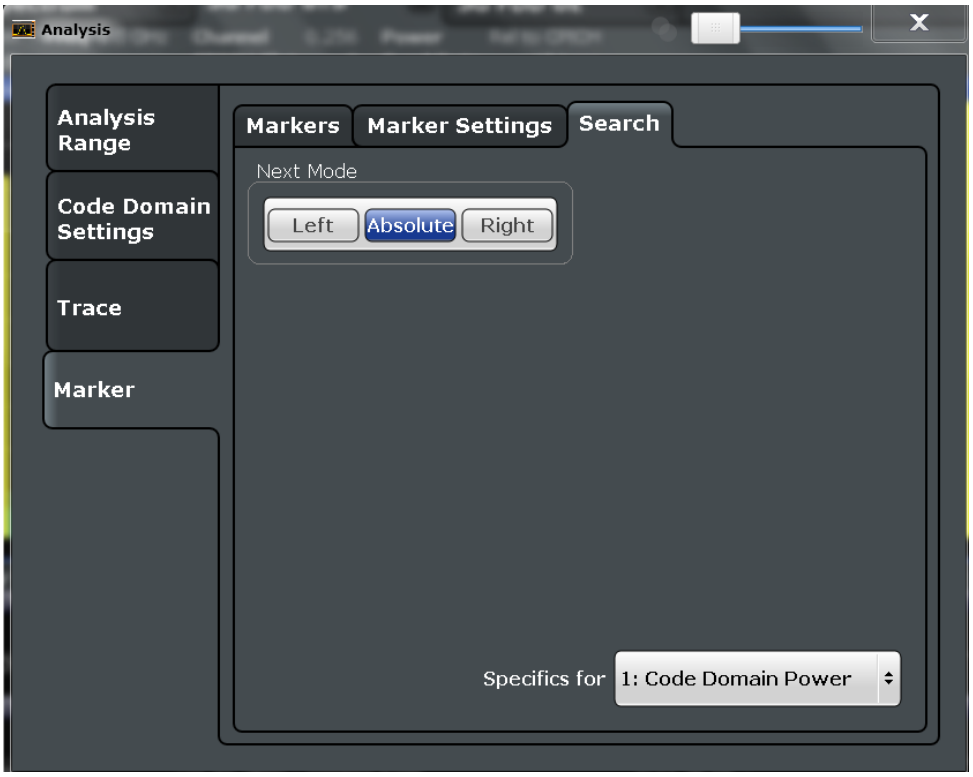
Remote command:
`DISPlay:MTABle` on page 241

7.4.3 Marker Search Settings

Several functions are available to set the marker to a specific position very quickly and easily. In order to determine the required marker position, searches may be performed. The search results can be influenced by special settings.

These settings are available as softkeys in the "Marker To" menu, or in the "Search" tab of the "Marker" dialog box. To display this tab, do one of the following:

- Press the MKR key, then select the "Marker Config" softkey. Then select the horizontal "Search" tab.
- In the "Overview", select "Analysis", and switch to the vertical "Marker Config" tab. Then select the horizontal "Search" tab.



Search Mode for Next Peak.....116

Search Mode for Next Peak
Selects the search mode for the next peak search.

"Left" Determines the next maximum/minimum to the left of the current peak.

"Absolute" Determines the next maximum/minimum to either side of the current peak.

"Right" Determines the next maximum/minimum to the right of the current peak.

Remote command:
CALCulate<n>:DELTamarker<m>:MAXimum:LEFT on page 244
CALCulate<n>:MARKer<m>:MAXimum:LEFT on page 242
CALCulate<n>:DELTamarker<m>:MAXimum:NEXT on page 244
CALCulate<n>:MARKer<m>:MAXimum:NEXT on page 242
CALCulate<n>:DELTamarker<m>:MAXimum:RIGHt on page 244
CALCulate<n>:MARKer<m>:MAXimum:RIGHt on page 242
CALCulate<n>:DELTamarker<m>:MINimum:LEFT on page 244
CALCulate<n>:MARKer<m>:MINimum:LEFT on page 243
CALCulate<n>:DELTamarker<m>:MINimum:NEXT on page 244
CALCulate<n>:MARKer<m>:MINimum:NEXT on page 243
CALCulate<n>:DELTamarker<m>:MINimum:RIGHt on page 245
CALCulate<n>:MARKer<m>:MINimum:RIGHt on page 243

7.4.4 Marker Positioning Functions

The following functions set the currently selected marker to the result of a peak search. These functions are available as softkeys in the "Marker To" menu, which is displayed when you press the MKR -> key.

Markers in Code Domain Analysis measurements

In Code Domain Analysis measurements, the markers are set to individual symbols, codes, slots or channels, depending on the result display. Thus you can use the markers to identify individual codes, for example.

Search Next Peak....117
Search Next Minimum....118
Peak Search....118
Search Minimum....118
Marker To PICH....118
Marker To TDPICH....118

Search Next Peak

Sets the selected marker/delta marker to the next (lower) maximum of the assigned trace. If no marker is active, marker 1 is activated.

Remote command:
CALCulate<n>:MARKer<m>:MAXimum:NEXT on page 242
CALCulate<n>:DELTamarker<m>:MAXimum:NEXT on page 244

Search Next Minimum
Sets the selected marker/delta marker to the next (higher) minimum of the selected trace. If no marker is active, marker 1 is activated.

Remote command:
CALCulate<n>:MARKer<m>:MINimum:NEXT on page 243
CALCulate<n>:DELTamarker<m>:MINimum:NEXT on page 244

Peak Search
Sets the selected marker/delta marker to the maximum of the trace. If no marker is active, marker 1 is activated.

Remote command:
CALCulate<n>:MARKer<m>:MAXimum[:PEAK] on page 243
CALCulate<n>:DELTamarker<m>:MAXimum[:PEAK] on page 244

Search Minimum
Sets the selected marker/delta marker to the minimum of the trace. If no marker is active, marker 1 is activated.

Remote command:
CALCulate<n>:MARKer<m>:MINimum[:PEAK] on page 243
CALCulate<n>:DELTamarker<m>:MINimum[:PEAK] on page 245

Marker To PICH
Sets the marker to the PICH channel.

Remote command:
CALCulate<n>:MARKer<m>:FUNCtion:PICH on page 242

Marker To TDPICH
Sets the marker to the TDPICH channel.

Remote command:
CALCulate<n>:MARKer<m>:FUNCtion:TDPIch on page 242

8 Optimizing and Troubleshooting the Measurement

If the results do not meet your expectations, try the following methods to optimize the measurement:

Synchronization fails:

- Check the center frequency.
- Perform an automatic reference level adjustment.
- In BTS measurements, when using an external trigger, check whether an external trigger signal is being sent to the R&S FSW and check the "PN offset ".
- In MS measurements, check the "Long Code Mask" and "Long Code Offset".
- Make sure "Invert Q" is off.

8.1 Error Messages

Error messages are entered in the error/event queue of the status reporting system in the remote control mode and can be queried with the command `SYSTem:ERRor?`.

A short explanation of the application-specific error messages for CDMA2000 measurements is given below.

Status bar message	Description
Sync not found	This message is displayed if synchronization is not possible. Possible causes are that frequency, level, or signal description values are set incorrectly, or the input signal is invalid.
Sync OK	This message is displayed if synchronization is possible.

9 How to Perform Measurements in CDMA2000 Applications

The following step-by-step instructions describe how to perform measurements with the CDMA2000 applications.

To perform Code Domain Analysis

1. Press the MODE key on the front panel and select the "cdma2000 BTS" application for base station tests, or "cdma2000 MS" for mobile station tests.

   Code Domain Analysis of the input signal is performed by default.
2. Select the "Overview" softkey to display the "Overview" for Code Domain Analysis.
3. Select the "Signal Description" button and configure the expected input signal.
4. Select the "Input/Frontend" button and then the "Frequency" tab to define the input signal's center frequency.
5. Optionally, select the "Trigger" button and define a trigger for data acquisition, for example an external trigger to start capturing data only when a useful signal is transmitted.
6. Select the "Signal Capture" button and define the acquisition parameters for the input signal.
   In MSRA mode, define the application data instead, see "To select the application data for MSRA measurements" on page 122.
7. Select the "Channel Detection" button and define how the individual channels are detected within the input signal. If necessary, define a channel table as described in "To define or edit a channel table" on page 121.
8. Select the "Display Config" button and select the evaluation methods that are of interest to you.
   Arrange them on the display to suit your preferences.
9. Exit the SmartGrid mode and select the "Overview" softkey to display the "Overview" again.
10. Select the "Analysis" button in the "Overview" to configure how the data is evaluated in the individual result displays.
    - Select the set, PCG/slot or code to be evaluated.
    - Configure specific settings for the selected evaluation method(s).
    - Optionally, configure the trace to display the average over a series of sweeps. If necessary, increase the "Sweep/Average Count" in the "Sweep Config" dialog box.
    - Configure markers and delta markers to determine deviations and offsets within the results, e.g. when comparing errors or peaks.
11. Start a new sweep with the defined settings.

In MSRA mode you may want to stop the continuous measurement mode by the Sequencer and perform a single data acquisition:

a) Select the Sequencer icon ( ) from the toolbar.
b) Set the Sequencer state to "OFF".
c) Press the RUN SINGLE key.

To define or edit a channel table

Channel tables contain a list of channels to be detected and their specific parameters. You can create user-defined and edit pre-defined channel tables.

1. From the main "Code Domain Analyzer" menu, select the "Channel Detection" softkey to open the "Channel Detection" dialog box.
2. To define a new channel table, select the "New" button next to the "Predefined Tables" list.
   To edit an existing channel table:
   a) Tap the existing channel table in the "Predefined Tables" list.
   b) Select the "Edit" button next to the "Predefined Tables" list.
3. In the "Channel Table" dialog box, define a name and, optionally, a comment that describes the channel table. The comment is displayed when you set the focus on the table in the "Predefined Tables" list.
4. Define the channels to be detected using one of the following methods:
   Select the "Measure Table" button to create a table that consists of the channels detected in the currently measured signal.
   Or:
   a) Select the "Add Channel" button to insert a row for a new channel below the currently selected row in the channel table.
   b) Define the channel specifications required for detection:
      - Channel type
      - Channel number and spreading factor used by the channel
      - Symbol rate
      - Which RC is used
        (BTS mode only)
      - Which mapping is applied **(MS mode only)**
      - The channel's code domain power (relative to the total signal power)
      - The channel's state (active or inactive)
5. Select the "Save Table" button to store the channel table.

   The table is stored and the dialog box is closed. The new channel table is included in the "Predefined Tables" list in the "Channel Detection" dialog box.
6. To activate the use of the new channel table:
   a) Select the table in the "Predefined Tables" list.
   b) Tap the "Select" button.
      A checkmark is displayed next to the selected table.

c) Toggle the "Use Predefined Channel Table" setting to "Predefined".
d) Toggle the "Compare Meas Signal with Predefined Table" setting to "On".
e) Start a new measurement.

To perform an RF measurement

1. Press the MODE key on the front panel and select the "cdma2000 BTS" application for base station tests, or "cdma2000 MS" for mobile station tests.

   Code Domain Analysis of the input signal is performed by default.

2. Select the RF measurement:

   a) Press the MEAS key on the front panel.
   b) In the "Select Measurement" dialog box, select the required measurement.

   The selected measurement is activated with the default settings for CDMA2000 immediately.

3. If necessary, adapt the settings as described for the individual measurements in the R&S FSW User Manual.

4. Select the "Display Config" button and select the evaluation methods that are of interest to you.
   Arrange them on the display to suit your preferences.

5. Exit the SmartGrid mode and select the "Overview" softkey to display the "Overview" again.

6. Select the "Analysis" button in the "Overview" to make use of the advanced analysis functions in the result displays.

   - Configure a trace to display the average over a series of sweeps; if necessary, increase the "Sweep Count" in the "Sweep" settings.
   - Configure markers and delta markers to determine deviations and offsets within the evaluated signal.
   - Use special marker functions to calculate noise or a peak list.
   - Configure a limit check to detect excessive deviations.

7. Optionally, export the trace data of the graphical evaluation results to a file.

   a) In the "Traces" tab of the "Analysis" dialog box, switch to the "Trace Export" tab.
   b) Select "Export Trace to ASCII File".
   c) Define a file name and storage location and select "OK".

To select the application data for MSRA measurements

In multi-standard radio analysis you can analyze the data captured by the MSRA Master in the CDMA2000 BTS application. Assuming you have detected a suspect area of the captured data in another application, you would now like to analyze the same data in the CDMA2000 BTS application.

1. Select the "Overview" softkey to display the "Overview" for Code Domain Analysis.

2. Select the "Signal Capture" button.

3. Define the application data range as and the "Number of Sets". You must determine the number of sets according to the following formula:
   <No of sets> = <measurement time in seconds> / 80 ms (time per set)
   Enter the next larger integer value.
4. Define the starting point of the application data as the "Capture offset". The offset is calculated according to the following formula:
   <capture offset> = <starting point for application> - <starting point in capture buffer>
5. The analysis interval is automatically determined according to the selected channel, slot or frame to analyze (defined for the evaluation range), depending on the result display. Note that the frame/slot/channel is analyzed *within the application data*. If the analysis interval does not yet show the required area of the capture buffer, move through the frames/slots/channels in the evaluation range or correct the application data range.
6. If the Sequencer is off, select the "Refresh" softkey in the "Sweep" menu to update the result displays for the changed application data.

10 Measurement Examples

The following measurement examples demonstrate the basic Code Domain Analysis functions for the CDMA2000 standard. These examples assume a basic test setup as described in chapter 4.9, "Test Setup for CDMA2000 Tests", on page 45.

The following measurement examples are basic CDMA2000 base station tests using a setup with a signal generator, e.g. an R&S SMU. They are meant to demonstrate how operating and measurement errors can be avoided using correct settings. The measurements are performed on a CDMA2000 signal with an R&S FSW equipped with the CDMA2000 BTS application.

Measurement examples for mobile station tests

The measurements can be performed for mobile station tests in a similar way with the CDMA2000 MS application. In this case, use the following settings:

- "DIGITAL STD > LINK DIRECTION > UP/REVERSE"
- "FREQ" = *833.49GHz*

The measurements are performed using the following devices and accessories:

- The R&S FSW with Application Firmware R&S FSW-K82: CDMA2000 Base Station Test
- The Vector Signal Generator R&S SMU with option R&S SMU-B46: digital standard CDMA2000 (options R&S SMU-B20 and R&S SMU-B11 required)
- 1 coaxial cable, 50Ω, approx. 1 m, N connector
- 1 coaxial cable, 50Ω, approx. 1 m, BNC connector

The following measurements are described:

- Meas 1: Measuring the Signal Channel Power.....124
- Meas 2: Measuring the Spectrum Emission Mask.....125
- Meas 3: Measuring the Relative Code Domain Power and Frequency Error.....126
- Meas 4: Measuring the Triggered Relative Code Domain Power.....128
- Meas 5: Measuring the Composite EVM.....129
- Meas 6: Measuring the Peak Code Domain Error and the RHO Factor.....130

10.1 Meas 1: Measuring the Signal Channel Power

In the Power measurement, the total channel power of the CDMA2000 signal is displayed. The measurement also displays spurious emissions like harmonics or intermodulation products that occur close to the carrier.

Test setup

► Connect the RF output of the R&S SMU to the RF input of the R&S FSW (coaxial cable with N connectors).

Settings on the R&S SMU

1. PRESET
2. "FREQ" = *878.49 MHz*
3. "LEVEL"= *0 dBm*
4. "DIGITAL STD" = "cdma2000"
5. "DIGITAL STD > Set Default"
6. "DIGITAL STD > LINK DIRECTION > DOWN/FORWARD"
7. "DIGITAL STD > cdma2000 > STATE"= "ON"

Settings on the R&S FSW

1. PRESET
2. "MODE > cdma2000 BTS"
3. "AMPT > Reference level"= *0 dBm*
4. "FREQ > Center frequency" = *878.49 MHz*
5. "MEAS > POWER"

   The spectrum of the signal and the corresponding power levels within the 1.2288 MHz channel bandwidth are displayed.

10.2 Meas 2: Measuring the Spectrum Emission Mask

The CDMA2000 specification calls for a measurement that monitors compliance with a spectral mask over a range of at least ±4.0 MHz around the CDMA2000 carrier. To assess the power emissions within the specified range, the signal power is measured with a 30kHz filter. The resulting trace is compared with a limit line as defined in the CDMA2000 standard. The limit lines are automatically selected as a function of the used band class.

Test setup

► Connect the RF output of the R&S SMU to the RF input of the R&S FSW (coaxial cable with N connectors).

Settings on the R&S SMU

1. PRESET
2. "FREQ" = *878.49 MHz*
3. "LEVEL"= *0 dBm*
4. "DIGITAL STD" = "cdma2000"
5. "DIGITAL STD > Set Default"

6. "DIGITAL STD > LINK DIRECTION > DOWN/FORWARD"
7. "DIGITAL STD > cdma2000 > STATE"= "ON"

Settings on the R&S FSW

1. PRESET
2. "MODE > cdma2000 BTS"
3. "AMPT > Reference level"= *0 dBm*
4. "FREQ > Center frequency" = *878.49 MHz*
5. "MEAS > Spectrum Emission Mask"

   The spectrum of the signal is displayed, including the limit line defined in the standard. To understand where and about how much the measurement has failed, the "List Evaluation" shows the frequencies where spurious emissions occur.

10.3 Meas 3: Measuring the Relative Code Domain Power and Frequency Error

A Code Domain Power measurement analyzes the signal over a single Power Control Group (PCG). It also determines the power of all codes and channels.

The following examples show a Code Domain Power measurement on a test model with 9 channels. In this measurement, changing some parameters one after the other should demonstrate the resulting effects: values adapted to the measurement signal are changed to non-adapted values.

Test setup

1. Connect the RF output of the R&S SMU to the input of the R&S FSW.
2. Connect the reference input (REF INPUT) on the rear panel of the R&S FSW to the reference input (REF) on the rear panel of the R&S SMU (coaxial cable with BNC connectors).

Settings on the R&S SMU

1. PRESET
2. "FREQ" = *878.49 MHz*
3. "LEVEL"= *0 dBm*
4. "DIGITAL STD" = "cdma2000"
5. "DIGITAL STD > Set Default"
6. "DIGITAL STD > LINK DIRECTION > DOWN/FORWARD"
7. "DIGITAL STD > cdma2000 > STATE"= "ON"

Settings on the R&S FSW

1. PRESET
2. "MODE > cdma2000 BTS"
3. "AMPT > Reference level"= *10 dBm*
4. "FREQ > Center frequency" = *878.49 MHz*

   The following results are displayed: the first window shows the power of the code domain of the signal. The x-axis represents the individual channels (or codes), while the y-axis shows the power of each channel.
   In the second window, the Result Summary is displayed. It shows the numeric results of the code domain power measurement, including the frequency error.

Synchronization of the reference frequencies

The frequency error can be reduced by synchronizing the transmitter and the receiver to the same reference frequency.

► "SETUP > Reference > External Reference ..."

Again, the first window shows the Code Domain Power measurement and the second window contains the Result Summary. After the reference frequencies of the devices have been synchronized, the frequency error should be smaller than 10 Hz.

Behavior with deviating center frequency setting

A measurement can only be valid if the center frequency of the DUT and the analyzer are balanced.

1. On the signal generator, change the center frequency in steps of 0.1 kHz and observe the analyzer display.
   Up to a frequency error of approximately 1.0 kHz, a Code Domain Power measurement on the R&S FSW is still possible. A frequency error within this range causes no apparent difference in the accuracy of the Code Domain Power measurement.
   In case of a frequency error of more than 1.0 kHz, the probability of incorrect synchronization increases. This is indicated by the "SYNC FAILED" error message.
   If the frequency error exceeds approximately 1.5 kHz, a Code Domain Power measurement cannot be performed. This is also indicated by the "SYNC FAILED" error message.
2. Reset the center frequency of the signal generator to *878.49 MHz*.

The center frequency of the DUT should not deviate by more than 1.0 kHz from that of the R&S FSW.

10.4 Meas 4: Measuring the Triggered Relative Code Domain Power

If the code domain power measurement is performed without external triggering, a section of the test signal is recorded at an arbitrary point of time and the firmware attempts to detect the start of a PCG. To detect this start, all possibilities of the PN sequence location have to be tested in Free Run trigger mode. This requires computing time. This computing time can be reduced by using an external (frame) trigger and entering the correct PN offset. If the search range for the start of the power control group and the PN offset are known then fewer possibilities have to be tested. This increases the measurement speed.

Test setup

1. Connect the RF output of the R&S SMU to the input of the R&S FSW.
2. Connect the reference input (REF INPUT) on the rear panel of the R&S FSW to the reference input (REF) on the rear panel of the R&S SMU (coaxial cable with BNC connectors).
3. Connect the external trigger input on the front panel of the R&S FSW (TRIGGER INPUT) to the external trigger output on the front panel of the R&S SMU (TRIGOUT1 of PAR DATA).

Settings on the R&S SMU

1. PRESET
2. "FREQ" = *878.49 MHz*
3. "LEVEL"= *0 dBm*
4. "DIGITAL STD" = "cdma2000"
5. "DIGITAL STD > Set Default"
6. "DIGITAL STD > LINK DIRECTION > DOWN/FORWARD"
7. "DIGITAL STD > cdma2000 > STATE"= "ON"

Settings on the R&S FSW

1. PRESET
2. "MODE > cdma2000 BTS"
3. "AMPT > Reference level"= *10 dBm*
4. "FREQ > Center frequency" = *878.49 MHz*
5. "TRIG > External Trigger 1"

   The following results are displayed: the first window shows the power of the code domain of the signal. Compared to the measurement without an external trigger (see chapter 10.3, "Meas 3: Measuring the Relative Code Domain Power and Frequency Error", on page 126), the repetition rate of the measurement increases.

In the second window, the Result Summary is displayed. It shows the numeric results of the code domain power measurement, including the frequency error. The "Trigger to Frame" shows the offset between the trigger event and and the start of the PCG.

10.4.1 Adjusting the Trigger Offset

The delay between the trigger event and the start of the PCG can be compensated for by adjusting the trigger offset.

1. "TRIG > External Trigger 1"
2. "TRIG > Trigger Offset" = *100 µs*

   The following results are displayed: the first window shows the power of the code domain of the signal.
   In the second window, the Result Summary is displayed. The "Trigger to Frame" offset between the trigger event and and the start of the PCG has been eliminated.

10.4.2 Behaviour With the Wrong PN Offset

The last adjustment is setting the PN (Pseudo Noise) offset correctly. The measurement is only valid if the PN offset on the analyzer is the same as that of the transmit signal.

► "Signal Description > PN Offset"= *200*.

In the Result Summary, the "Trigger to Frame" result is not correct. Also, the error message `SYNC FAILED` indicates that the synchronization has failed.

Correct the "PN Offset".

► "Signal Description > PN Offset"= *0*.

Now the PN offset on the R&S FSW is the same as that of the signal. In the Result Summary the "Trigger to Frame" value is now correct.

10.5 Meas 5: Measuring the Composite EVM

The Error Vector Magnitude (EVM) describes the quality of the measured signal compared to an ideal reference signal generated by the R&S FSW. In the I-Q plane, the error vector represents the ratio of the measured signal to the ideal signal on symbol level. The error vector is equal to the square root of the ratio of the measured signal to the reference signal. The result is given in %.

In the Composite EVM measurement the error is averaged over all channels (by means of the root mean square) for a given PCG. The measurement covers the entire signal during the entire observation time. In the graphical display the results are shown in a diagram, in which the x-axis represents the examined PCGs and the y-axis shows the EVM values.

Test setup

1. Connect the RF output of the R&S SMU to the input of the R&S FSW.
2. Connect the reference input (REF INPUT) on the rear panel of the R&S FSW to the reference input (REF) on the rear panel of the R&S SMU (coaxial cable with BNC connectors).
3. Connect the external trigger input on the front panel of the R&S FSW (TRIGGER INPUT) to the external trigger output on the front panel of the R&S SMU (TRIGOUT1 of PAR DATA).

Settings on the R&S SMU

1. PRESET
2. "FREQ" = *878.49 MHz*
3. "LEVEL"= *0 dBm*
4. "DIGITAL STD" = "cdma2000"
5. "DIGITAL STD > Set Default"
6. "DIGITAL STD > LINK DIRECTION > DOWN/FORWARD"
7. "DIGITAL STD > cdma2000 > STATE"= "ON"

Settings on the R&S FSW

1. PRESET
2. "MODE > cdma2000 BTS"
3. "AMPT > Reference level"= *10 dBm*
4. "FREQ > Center frequency" = *878.49 MHz*
5. "TRIG > External Trigger 1"
6. "MEAS CONFIG > Display Config > Composite EVM" (Window 2)
7. "AMPT > Scale Config > Auto Scale Once"

   The following results are displayed: the first window shows the diagram of the Composite EVM measurement result. In the second window, the Result Summary is displayed. It shows the numeric results of the Code Domain Power measurement, including the values for the Composite EVM.

10.6 Meas 6: Measuring the Peak Code Domain Error and the RHO Factor

The Code Domain Error Power describes the quality of the measured signal compared to an ideal reference signal generated by the R&S FSW. In the I-Q plane, the error vector

represents the difference of the measured signal and the ideal signal. The Code Domain Error is the difference in power on symbol level of the measured and the reference signal projected to the class of of the base spreading factor. The unit of the result is dB.

In the Peak Code Domain Error (PCDE) measurement, the maximum error value over all channels is determined and displayed for a given PCG. The measurement covers the entire signal during the entire observation time. In the graphical display the results are shown in a diagram, in which the x-axis represents the PCGs and the y-axis shows the PCDE values.

A measurement of the RHO factor is shown in the second part of the example. RHO is the normalized, correlated power between the measured and the ideal reference signal. The maximum value of RHO is 1. In that case the measured signal and the reference signal are identical. When measuring RHO, it is required that only the pilot channel is active.

Test setup

1. Connect the RF output of the R&S SMU to the input of the R&S FSW.
2. Connect the reference input (REF INPUT) on the rear panel of the R&S FSW to the reference input (REF) on the rear panel of the R&S SMU (coaxial cable with BNC connectors).
3. Connect the external trigger input on the front panel of the R&S FSW (TRIGGER INPUT) to the external trigger output on the front panel of the R&S SMU (TRIGOUT1 of PAR DATA).

Settings on the R&S SMU

1. PRESET
2. "FREQ" = *878.49 MHz*
3. "LEVEL" = *0 dBm*
4. "DIGITAL STD" = "cdma2000"
5. "DIGITAL STD > Set Default"
6. "DIGITAL STD > LINK DIRECTION > DOWN/FORWARD"
7. "DIGITAL STD > cdma2000 > STATE" = "ON"

Settings on the R&S FSW

1. PRESET
2. "MODE > cdma2000 BTS"
3. "AMPT > Reference level"= *0 dBm*
4. "FREQ > Center frequency" = *878.49 MHz*
5. "TRIG > External Trigger 1"
6. "MEAS CONFIG > Display Config > Peak Code Domain Error" (Window 1)

7. "AMPT > Scale Config > Auto Scale Once"

   The following results are displayed: the first window shows the diagram of the Peak Code Domain Error. In the second window, the Result Summary is displayed.

Displaying RHO

Make sure that all channels except the pilot channel (code 0.64) are OFF, so that only the pilot channel is available in the measurement.

No specific measurement is required to get the value for RHO. The R&S FSW always calculates this value automatically regardless of the code domain measurement performed. Besides the results of the code domain measurements, the numeric result of the RHO measurement is shown in the Result Summary, by default in the second window.

11 Remote Commands for CDMA2000 Measurements

The following commands are required to perform measurements in CDMA2000 applications in a remote environment. It assumes that the R&S FSW has already been set up for remote operation in a network as described in the base unit manual.

Note that basic tasks that are also performed in the base unit in the same way are not described here. For a description of such tasks, see the R&S FSW User Manual.

In particular, this includes:

- Managing Settings and Results, i.e. storing and loading settings and result data
- Basic instrument configuration, e.g. checking the system configuration, customizing the screen layout, or configuring networks and remote operation
- Using the common status registers

After a short introduction to remote commands, the tasks specific to CDMA2000 applications are described here:

- Introduction....133
- Common Suffixes....138
- Activating the Measurement Channel....138
- Selecting a Measurement....142
- Configuring Code Domain Analysis....143
- Configuring RF Measurements....199
- Configuring the Result Display....200
- Starting a Measurement....209
- Retrieving Results....214
- General Analysis....236
- Importing and Exporting I/Q Data and Results....245
- Configuring the Application Data Range (MSRA mode only)....246
- Querying the Status Registers....248
- Commands for Compatibility....250

11.1 Introduction

Commands are program messages that a controller (e.g. a PC) sends to the instrument or software. They operate its functions ('setting commands' or 'events') and request information ('query commands'). Some commands can only be used in one way, others work in two ways (setting and query). If not indicated otherwise, the commands can be used for settings and queries.

The syntax of a SCPI command consists of a header and, in most cases, one or more parameters. To use a command as a query, you have to append a question mark after the last header element, even if the command contains a parameter.

A header contains one or more keywords, separated by a colon. Header and parameters are separated by a "white space" (ASCII code 0 to 9, 11 to 32 decimal, e.g. blank). If there is more than one parameter for a command, these are separated by a comma from one another.

Only the most important characteristics that you need to know when working with SCPI commands are described here. For a more complete description, refer to the User Manual of the R&S FSW.

Remote command examples

Note that some remote command examples mentioned in this general introduction may not be supported by this particular application.

11.1.1 Conventions used in Descriptions

Note the following conventions used in the remote command descriptions:

- **Command usage**
  If not specified otherwise, commands can be used both for setting and for querying parameters.
  If a command can be used for setting or querying only, or if it initiates an event, the usage is stated explicitely.
- **Parameter usage**
  If not specified otherwise, a parameter can be used to set a value and it is the result of a query.
  Parameters required only for setting are indicated as **Setting parameters**.
  Parameters required only to refine a query are indicated as **Query parameters**.
  Parameters that are only returned as the result of a query are indicated as **Return values**.
- **Conformity**
  Commands that are taken from the SCPI standard are indicated as **SCPI confirmed**. All commands used by the R&S FSW follow the SCPI syntax rules.
- **Asynchronous commands**
  A command which does not automatically finish executing before the next command starts executing (overlapping command) is indicated as an **Asynchronous command**.
- **Reset values (*RST)**
  Default parameter values that are used directly after resetting the instrument (`*RST` command) are indicated as ***RST** values, if available.
- **Manual operation**
  If the result of a remote command can also be achieved in manual operation, a link to the description is inserted.

11.1.2 Long and Short Form

The keywords have a long and a short form. You can use either the long or the short form, but no other abbreviations of the keywords.

The short form is emphasized in upper case letters. Note however, that this emphasis only serves the purpose to distinguish the short from the long form in the manual. For the instrument, the case does not matter.

Example:

`SENSe:FREQuency:CENTer` is the same as `SENS:FREQ:CENT`.

11.1.3 Numeric Suffixes

Some keywords have a numeric suffix if the command can be applied to multiple instances of an object. In that case, the suffix selects a particular instance (e.g. a measurement window).

Numeric suffixes are indicated by angular brackets (<n>) next to the keyword.

If you don't quote a suffix for keywords that support one, a 1 is assumed.

Example:

`DISPlay[:WINDow<1...4>]:ZOOM:STATe` enables the zoom in a particular measurement window, selected by the suffix at `WINDow`.

`DISPlay:WINDow4:ZOOM:STATe ON` refers to window 4.

11.1.4 Optional Keywords

Some keywords are optional and are only part of the syntax because of SCPI compliance. You can include them in the header or not.

Note that if an optional keyword has a numeric suffix and you need to use the suffix, you have to include the optional keyword. Otherwise, the suffix of the missing keyword is assumed to be the value 1.

Optional keywords are emphasized with square brackets.

Example:

Without a numeric suffix in the optional keyword:

`[SENSe:]FREQuency:CENTer` is the same as `FREQuency:CENTer`

With a numeric suffix in the optional keyword:

`DISPlay[:WINDow<1...4>]:ZOOM:STATe`

`DISPlay:ZOOM:STATe ON` enables the zoom in window 1 (no suffix).

`DISPlay:WINDow4:ZOOM:STATe ON` enables the zoom in window 4.

11.1.5 Alternative Keywords

A vertical stroke indicates alternatives for a specific keyword. You can use both keywords to the same effect.

Example:

`[SENSe:]BANDwidth|BWIDth[:RESolution]`

In the short form without optional keywords, `BAND 1MHZ` would have the same effect as `BWID 1MHZ`.

11.1.6 SCPI Parameters

Many commands feature one or more parameters.

If a command supports more than one parameter, these are separated by a comma.

Example:

```
LAYout:ADD:WINDow Spectrum,LEFT,MTABle
```

Parameters may have different forms of values.

- Numeric Values....136
- Boolean....137
- Character Data....137
- Character Strings....138
- Block Data....138

11.1.6.1 Numeric Values

Numeric values can be entered in any form, i.e. with sign, decimal point or exponent. In case of physical quantities, you can also add the unit. If the unit is missing, the command uses the basic unit.

Example:

with unit: `SENSe:FREQuency:CENTer 1GHZ`

without unit: `SENSe:FREQuency:CENTer 1E9` would also set a frequency of 1 GHz.

Values exceeding the resolution of the instrument are rounded up or down.

If the number you have entered is not supported (e.g. in case of discrete steps), the command returns an error.

Instead of a number, you can also set numeric values with a text parameter in special cases.

- MIN/MAX
  Defines the minimum or maximum numeric value that is supported.
- DEF
  Defines the default value.
- UP/DOWN
  Increases or decreases the numeric value by one step. The step size depends on the setting. In some cases you can customize the step size with a corresponding command.

Querying numeric values

When you query numeric values, the system returns a number. In case of physical quantities, it applies the basic unit (e.g. Hz in case of frequencies). The number of digits after the decimal point depends on the type of numeric value.

Example:

Setting: `SENSe:FREQuency:CENTer 1GHZ`

Query: `SENSe:FREQuency:CENTer?` would return `1E9`

In some cases, numeric values may be returned as text.

- INF/NINF
  Infinity or negative infinity. Represents the numeric values 9.9E37 or -9.9E37.
- NAN
  Not a number. Represents the numeric value 9.91E37. NAN is returned in case of errors.

11.1.6.2 Boolean

Boolean parameters represent two states. The "ON" state (logically true) is represented by "ON" or a numeric value 1. The "OFF" state (logically untrue) is represented by "OFF" or the numeric value 0.

Querying boolean parameters

When you query boolean parameters, the system returns either the value 1 ("ON") or the value 0 ("OFF").

Example:

Setting: `DISPlay:WINDow:ZOOM:STATe ON`

Query: `DISPlay:WINDow:ZOOM:STATe?` would return `1`

11.1.6.3 Character Data

Character data follows the syntactic rules of keywords. You can enter text using a short or a long form. For more information see chapter 11.1.2, "Long and Short Form", on page 134.

Querying text parameters

When you query text parameters, the system returns its short form.

Example:

Setting: `SENSe:BANDwidth:RESolution:TYPE NORMal`

Query: `SENSe:BANDwidth:RESolution:TYPE?` would return `NORM`

11.1.6.4 Character Strings

Strings are alphanumeric characters. They have to be in straight quotation marks. You can use a single quotation mark (') or a double quotation mark (").

Example:

```
INSTRument:DELete 'Spectrum'
```

11.1.6.5 Block Data

Block data is a format which is suitable for the transmission of large amounts of data.

The ASCII character # introduces the data block. The next number indicates how many of the following digits describe the length of the data block. In the example the 4 following digits indicate the length to be 5168 bytes. The data bytes follow. During the transmission of these data bytes all end or other control signs are ignored until all bytes are transmitted. #0 specifies a data block of indefinite length. The use of the indefinite format requires a NL^END message to terminate the data block. This format is useful when the length of the transmission is not known or if speed or other considerations prevent segmentation of the data into blocks of definite length.

11.2 Common Suffixes

In CDMA2000 applications, the following common suffixes are used in remote commands (and not described for each command individually):

Suffix	Value range	Description
<n>	1..16	Window
<t>	1 (CDA) 6 (RF)	Trace
<m>	1..4 (CDA) 1..16 (RF)	Marker
<ch>	1..18 (TX channel) 1..11 (ALT channel)	Channel in RF measurements
<k>	1..8 (Limit line) 1 | 2 (Display line)	Line in RF measurements

11.3 Activating the Measurement Channel

CDMA2000 measurements require a special application on the R&S FSW. The measurement is started immediately with the default settings.

INSTrument:CREate:DUPLicate....139
INSTrument:CREate[:NEW]....139
INSTrument:CREate:REPLace....139
INSTrument:DELete....140
INSTrument:LIST?....140
INSTrument:REName....141
INSTrument[:SELect]....142
SYSTem:PRESet:CHANnel[:EXECute]....142

INSTrument:CREate:DUPLicate

This command duplicates the currently selected measurement channel, i.e starts a new measurement channel of the same type and with the identical measurement settings. The name of the new channel is the same as the copied channel, extended by a consecutive number (e.g. "Spectrum" -> "Spectrum 2").

The channel to be duplicated must be selected first using the `INST:SEL` command.

This command is not available if the MSRA Master channel is selected.

Example:
```
INST:SEL 'Spectrum'
INST:CRE:DUPL
```
Duplicates the channel named 'Spectrum' and creates a new measurement channel named 'Spectrum 2'.

Usage: Event

INSTrument:CREate[:NEW] <ChannelType>, <ChannelName>

This command adds an additional measurement channel. The number of measurement channels you can configure at the same time depends on available memory.

Parameters:

<ChannelType> Channel type of the new channel.
For a list of available channel types see table 11-1.

<ChannelName> String containing the name of the channel. The channel name is displayed as the tab label for the measurement channel.
Note: If the specified name for a new channel already exists, the default name, extended by a sequential number, is used for the new channel (see table 11-1).

Example:
```
INST:CRE SAN, 'Spectrum 2'
```
Adds an additional spectrum display named "Spectrum 2".

INSTrument:CREate:REPLace <ChannelName1>,<ChannelType>,<ChannelName2>

This command replaces a measurement channel with another one.

Parameters:

<ChannelName1> String containing the name of the measurement channel you want to replace.

<ChannelType> Channel type of the new channel.
For a list of available channel types see table 11-1.

<ChannelName2> String containing the name of the new channel.
Note: If the specified name for a new channel already exists, the default name, extended by a sequential number, is used for the new channel (see table 11-1).

Example: `INST:CRE:REPL 'Spectrum2',IQ,'IQAnalyzer'`
Replaces the channel named 'Spectrum2' by a new measurement channel of type 'IQ Analyzer' named 'IQAnalyzer'.

INSTrument:DELete <ChannelName>

This command deletes a measurement channel. If you delete the last measurement channel, the default "Spectrum" channel is activated.

Parameters:
<ChannelName> String containing the name of the channel you want to delete.
A measurement channel must exist in order to be able delete it.

Example: `INST:DEL 'Spectrum4'`
Deletes the spectrum channel with the name 'Spectrum4'.

INSTrument:LIST?

This command queries all active measurement channels. This is useful in order to obtain the names of the existing measurement channels, which are required in order to replace or delete the channels.

Return values:
<ChannelType>, <ChannelName> For each channel, the command returns the channel type and channel name (see table 11-1).
Tip: to change the channel name, use the `INSTrument:REName` command.

Example: `INST:LIST?`
Result for 3 measurement channels:
`'ADEM','Analog Demod','IQ','IQ Analyzer','SANALYZER','Spectrum'`

Usage: Query only

Table 11-1: Available measurement channel types and default channel names

Application	<ChannelType> Parameter	Default Channel Name*)
Spectrum	SANALYZER	Spectrum
I/Q Analyzer	IQ	IQ Analyzer
Pulse (R&S FSW-K6)	PULSE	Pulse
Note: the default channel name is also listed in the table. If the specified name for a new channel already exists, the default name, extended by a sequential number, is used for the new channel.		

Application	<ChannelType> Parameter	Default Channel Name*)
Analog Demodulation (R&S FSW-K7)	ADEM	Analog Demod
GSM (R&S FSW-K10)	GSM	GSM
Multi-Carrier Group Delay (R&S FSW-K17)	MCGD	MC Group Delay
Noise (R&S FSW-K30)	NOISE	Noise
Phase Noise (R&S FSW-K40)	PNOISE	Phase Noise
VSA (R&S FSW-K70)	DDEM	VSA
3GPP FDD BTS (R&S FSW-K72)	BWCD	3G FDD BTS
3GPP FDD UE (R&S FSW-K73)	MWCD	3G FDD UE
TD-SCDMA BTS (R&S FSW-K76)	BTDS	TD-SCDMA BTS
TD-SCDMA UE (R&S FSW-K77)	MTDS	TD-SCDMA UE
cdma2000 BTS (R&S FSW-K82)	BC2K	CDMA2000 BTS
cdma2000 MS (R&S FSW-K83)	MC2K	CDMA2000 MS
1xEV-DO BTS (R&S FSW-K84)	BDO	1xEV-DO BTS
1xEV-DO MS (R&S FSW-K85)	MDO	1xEV-DO MS
WLAN (R&S FSW-K91)	WLAN	WLAN
LTE (R&S FSW-K10x)	LTE	LTE
Note: the default channel name is also listed in the table. If the specified name for a new channel already exists, the default name, extended by a sequential number, is used for the new channel.		

INSTrument:REName <ChannelName1>, <ChannelName2>

This command renames a measurement channel.

Parameters:

<ChannelName1> String containing the name of the channel you want to rename.

<ChannelName2> String containing the new channel name.
Note that you can not assign an existing channel name to a new channel; this will cause an error.

Example: `INST:REN 'Spectrum2','Spectrum3'`
Renames the channel with the name 'Spectrum2' to 'Spectrum3'.

INSTrument[:SELect] <ChannelType>

This command activates a new measurement channel with the defined channel type, or selects an existing measurement channel with the specified name.

See also `INSTrument:CREate[:NEW]` on page 139.

For a list of available channel types see table 11-1.

Parameters:

<ChannelType>

BC2K
cdma2000 BTS option, R&S FSW–K82

MC2K
cdma2000 MS option, R&S FSW–K83

SYSTem:PRESet:CHANnel[:EXECute]

This command restores the default instrument settings in the current channel.

Use `INST:SEL` to select the channel.

Example:
```
INST 'Spectrum2'
```
Selects the channel for "Spectrum2".
```
SYST:PRES:CHAN:EXEC
```
Restores the factory default settings to the "Spectrum2" channel.

Usage: Event

Manual operation: See "Preset Channel" on page 56

11.4 Selecting a Measurement

The following commands are required to define the measurement type in a remote environment. For details on available measurements see chapter 3, "Measurements and Result Displays", on page 15.

CONFigure:CDPower[:BTS]:MEASurement.....142

CONFigure:CDPower[:BTS]:MEASurement <Measurement>

This command selects the RF measurement type (with predefined settings according to the CDMA2000 standard).

Parameters:

<Measurement> ACLR | CCDF | CDPower | ESPectrum | OBWidth | POWer

ACLR
Adjacent-Channel Power measurement

CCDF
measurement of the complementary cumulative distribution function (signal statistics)

CDPower
Code Domain Analyzer measurement.

ESPectrum
check of signal power (Spectrum Emission Mask)

OBWidth
measurement of the occupied bandwidth

POWer
Signal Channel Power measurement
(with predefined settings according to the CDMA2000 standard)

*RST: CDPower

Example: `CONF:CDP:MEAS POW`
Selects Signal Channel Power measurement.

Manual operation: See "Power" on page 28
See "Channel Power ACLR" on page 29
See "Spectrum Emission Mask" on page 30
See "Occupied Bandwidth" on page 31
See "CCDF" on page 32
See "Creating a New Channel Table from the Measured Signal (Measure Table)" on page 93

11.5 Configuring Code Domain Analysis

- Signal Description....144
- Configuring the Data Input and Output....149
- Frontend Configuration....165
- Configuring Triggered Measurements....173
- Signal Capturing....182
- Channel Detection....183
- Sweep Settings....191
- Automatic Settings....192
- Evaluation Range....195
- Code Domain Analysis Settings....196

11.5.1 Signal Description

The signal description provides information on the expected input signal.

- BTS Signal Description....144
- MS Signal Description....147

11.5.1.1 BTS Signal Description

The following commands describe the input signal in BTS measurements.

For more information see chapter 4.7, "Transmission with Multiple Carriers and Multiple Antennas", on page 41.

CONFigure:CDPower[:BTS]:MCARrier:FILTer:COFRequency....144
CONFigure:CDPower[:BTS]:MCARrier:FILTer:ROFF....144
CONFigure:CDPower[:BTS]:MCARrier:FILTer[:STATe]....145
CONFigure:CDPower[:BTS]:MCARrier:FILTer:TYPE....145
CONFigure:CDPower[:BTS]:MCARrier:MALGo....146
CONFigure:CDPower[:BTS]:MCARrier[:STATe]....146
[SENSe:]CDPower:ANTenna....146
[SENSe:]CDPower:PNOFfset....147

CONFigure:CDPower[:BTS]:MCARrier:FILTer:COFRequency <Frequency>

This command sets the cut-off frequency for the RRC filter.

Parameters:

<Frequency> Range: 0.1 MHz to 2.4 MHz
*RST: 1.25

Example:
```
CONF:CDP:MCAR ON
```
Activates multi-carrier mode
```
CONF:CDP:MCAR:FILT ON
```
Activates an additional filter for multi-carrier measurements
```
CONF:CDP:MCAR:FILT:TYPE RRC
```
Activates the RRC filter
```
CONF:CDP:MCAR:FILT:COFR 1.5MHZ
```
Sets the cut-off frequency to 1.5 MHz

Manual operation: See "Multi Carrier" on page 59
See "Filter Type" on page 59
See "Cut Off Frequency" on page 60

CONFigure:CDPower[:BTS]:MCARrier:FILTer:ROFF <RollOffFactor>

This command sets the roll-off factor for the RRC filter.

Parameters:

<RollOffFactor> Range: 0.01 to 0.99
*RST: 0.02

Example: CONF:CDP:MCAR ON
Activates multi-carrier mode
CONF:CDP:MCAR:FILT ON
Activates an additional filter for multi-carrier measurements
CONF:CDP:MCAR:FILT:TYPE RRC
Activates the RRC filter
CONF:CDP:MCAR:FILT:ROFF 0.05
Sets the roll-off factor to 0.05

Manual operation: See "Multi Carrier" on page 59
See "Filter Type" on page 59
See "Roll-Off Factor" on page 59

CONFigure:CDPower[:BTS]:MCARrier:FILTer[:STATe] <State>

This command activates or deactivates the usage of a filter for multi-carrier measurements.

Parameters:
<State> ON | OFF
*RST: OFF

Example: CONF:CDP:MCAR ON
Activates multi-carrier mode
CONF:CDP:MCAR:FILT OFF
Activates an additional filter for multi-carrier measurements

Manual operation: See "Multi Carrier" on page 59
See "Multi Carrier Filter" on page 59

CONFigure:CDPower[:BTS]:MCARrier:FILTer:TYPE <Type>

This command sets the filter type to be used in multi-carrier mode.

You can set the parameters for the RRC filter with the CONFigure:CDPower[:BTS]:MCARrier:FILTer:COFRequency and CONFigure:CDPower[:BTS]:MCARrier:FILTer:ROFF commands.

Parameters:
<Type> LPASs | RCC
*RST: LPAS

Example: CONF:CDP:MCAR ON
Activates multi-carrier mode
CONF:CDP:MCAR:FILT ON
Activates an additional filter for multi-carrier measurements
CONF:CDP:MCAR:FILT:TYPE RRC
Activates the RRC filter

Manual operation: See "Multi Carrier" on page 59
See "Filter Type" on page 59
See "Roll-Off Factor" on page 59
See "Cut Off Frequency" on page 60

CONFigure:CDPower[:BTS]:MCARrier:MALGo <State>

This command activates or deactivates the enhanced algorithm for the filters in multi-carrier mode.

Parameters:
<State> ON | OFF
*RST: ON

Example: `CONF:CDP:MCAR ON`
Activates multi-carrier mode
`CONF:CDP:MCAR:FILT ON`
Activates an additional filter for multi-carrier measurements
`CONF:CDP:MCAR:MALG OFF`
Deactivates the enhanced algorithm

Manual operation: See "Multi Carrier" on page 59
See "Enhanced Algorithm" on page 59

CONFigure:CDPower[:BTS]:MCARrier[:STATe] <State>

This command activates or deactivates the multi-carrier mode.

Parameters:
<State> ON | OFF
*RST: OFF

Example: `CONF:CDP:MCAR ON`
Activates the multi-carrier settings.

Manual operation: See "Multi Carrier" on page 59

[SENSe:]CDPower:ANTenna <AntennaState>

This command deactivates the orthogonal transmit diversity (two-antenna system) or defines the antenna for which the result display is evaluated.

For details on antenna diversity see also chapter 4.7.2, "Antenna Diversity", on page 42.

Parameters:

<AntennaState> OFF | 1 | 2

OFF
The aggregate signal from both antennas is fed in.

1
The signal of antenna 1 is fed in.

2
The signal of antenna 2 is fed in.

*RST: OFF

For further details refer to "Antenna Diversity - Antenna Number" on page 58.

Example: `CDP:ANT 2`
Selects antenna 2.

Manual operation: See "Antenna Diversity - Antenna Number" on page 58

[SENSe:]CDPower:PNOFfset <Offset>

This command sets the PN offset of the base station in multiples of 64 chips.

Parameters:

<Offset> Range: 0 to 511
*RST: 0

Example: `CDP:PNOF 45`
Sets PN offset.

Manual operation: See "PN Offset" on page 58

11.5.1.2 MS Signal Description

The following commands describe the input signal in MS measurements.

For more information see "Long code scrambling" on page 40.

Useful commands for describing MS signals described elsewhere:

- `CONFigure:CDPower[:BTS]:MCARrier:FILTer:COFRequency` on page 144
- `CONFigure:CDPower[:BTS]:MCARrier:FILTer:ROFF` on page 144
- `CONFigure:CDPower[:BTS]:MCARrier:FILTer:TYPE` on page 145
- `CONFigure:CDPower[:BTS]:MCARrier:FILTer[:STATe]` on page 145
- `CONFigure:CDPower[:BTS]:MCARrier:MALGo` on page 146
- `CONFigure:CDPower[:BTS]:MCARrier[:STATe]` on page 146

Remote commands exclusive to describing MS signals:

[SENSe:]CDPower:LCODe:MASK....148
[SENSe:]CDPower:LCODe:MODE....148
[SENSe:]CDPower:LCODe:OFFSet....148

[SENSe:]CDPower:LCODe:MASK <Mask>

Defines the long code mask of the mobile in hexadecimal form.

Note: For the default mask value of 0 the long code offset (see) is not taken into consideration.

Parameters:

<Mask> Range: #H0 to #H4FFFFFFFFF
*RST: #H0

Example:
```
INST:SEL MC2K
```
'Activate cdma2000 MS; by default, "CDP relative" is displayed in screen A and "Result Summary" in screen B.
```
INIT:CONT OFF
```
'Select single sweep
```
TRIG:SOUR:EXT
```
'Select external trigger source
```
CDP:LCOD:MASK '#HF'
```
'Define long code mask
```
INIT;*WAI
```
'Start measurement with synchronization

Manual operation: See "Long Code Mask" on page 60

[SENSe:]CDPower:LCODe:MODE <Mode>

This command selects the mode of the long code generation.

Parameters:

<Mode>

STANdard
The cdma2000 standard long code generator is used.

ESG101
The Agilent ESG option 101 long code is used; in this case, only signals from that generator can be analysed.

*RST: STANdard

Manual operation: See "Long Code Generation" on page 61

[SENSe:]CDPower:LCODe:OFFSet <CodeOffset>

Defines the long code offset, including the PN offset. This offset is applied at the next trigger pulse (which cannot occur until a setup time of 300 ms has elapsed).

This command is ignored if `[SENSe:]CDPower:LCODe:MODE` is set to 0.

Parameters:

<CodeOffset> **Offset in chips in hexadecimal format with a 52-bit resolution. The chips offset is calculated as follows: tSinceStartGPS * 1.2288 MChips/s, where tSinceStartGPS is defined in seconds.**
This value corresponds to the GPS timing since 6.1.1980 00:00:00 UTC.
*RST: #H0

Example: The hexadecimal offset of 258000 h chips is set for the first even second clock trigger:

```
INST:SEL MC2K
'Activate cdma2000 MS; by default, "CDP relative" is displayed in screen A and "Result Summary" in screen B.
INIT:CONT OFF
'Select single sweep
TRIG:SOUR:EXT
'Select external trigger source
CDP:LCOD:MASK '#H2'
'Define long code mask
CDP:LCOD:OFFS '#H258000'
'Define long code offset
INIT;*WAI
'Start measurement with synchronization
```

Manual operation: See "Long Code Offset" on page 61

11.5.2 Configuring the Data Input and Output

The following commands are required to configure data input and output. For more information see chapter 6.2.4, "Data Input and Output Settings", on page 62.

- RF Input....149
- Remote Commands for the Digital Baseband Interface (R&S FSW-B17)....152
- Configuring Input via the Analog Baseband Interface (R&S FSW-B71)....160
- Setting up Probes....162
- Configuring the Outputs....165

11.5.2.1 RF Input

INPut:ATTenuation:PROTection:RESet....150
INPut:CONNector....150
INPut:COUPling....150
INPut:FILTer:HPASs[:STATe]....151
INPut:FILTer:YIG[:STATe]....151
INPut:IMPedance....151
INPut:SELect....152

INPut:ATTenuation:PROTection:RESet

This command resets the attenuator and reconnects the RF input with the input mixer after an overload condition occured and the protection mechanism intervened.The error status bit (bit 3 in the `STAT:QUES:POW` status register) and the `INPUT OVLD` message in the status bar are cleared.

(For details on the status register see the R&S FSW User Manual).

The command works only if the overload condition has been eliminated first.

Usage: Event

INPut:CONNector <ConnType>

Determines whether the RF input data is taken from the RF input connector or the optional Analog Baseband I connector. This command is only available if the Analog Baseband interface (R&S FSW-B71) is installed and active for input.

For more information on the Analog Baseband Interface (R&S FSW-B71) see the R&S FSW I/Q Analyzer and I/Q Input User Manual.

Parameters:

<CouplingType>
RF
RF input connector
AIQI
Analog Baseband I connector
*RST: RF

Example: `INP:CONN:AIQI`

Usage: SCPI confirmed

Manual operation: See "Input Connector" on page 64

INPut:COUPling <CouplingType>

This command selects the coupling type of the RF input.

The command is not available for measurements with the Digital Baseband Interface (R&S FSW-B17).

Parameters:

<CouplingType>
AC
AC coupling
DC
DC coupling
*RST: AC

Example: `INP:COUP:DC`

Usage: SCPI confirmed

Manual operation: See "Input Coupling" on page 63

INPut:FILTer:HPASs[:STATe] <State>

Activates an additional internal high-pass filter for RF input signals from 1 GHz to 3 GHz. This filter is used to remove the harmonics of the R&S FSW in order to measure the harmonics for a DUT, for example.

This function requires option R&S FSW-B13.

(Note: for RF input signals outside the specified range, the high-pass filter has no effect. For signals with a frequency of approximately 4 GHz upwards, the harmonics are suppressed sufficiently by the YIG filter.)

Parameters:

<State> ON | OFF

*RST: OFF

Usage: SCPI confirmed

Manual operation: See "High-Pass Filter 1...3 GHz" on page 64

INPut:FILTer:YIG[:STATe] <State>

This command turns the YIG-preselector on and off.

Note the special conditions and restrictions for the YIG filter described in "YIG-Preselector" on page 64.

Parameters:

<State> ON | OFF | 0 | 1

*RST: 1 (0 for I/Q Analyzer, GSM, VSA and MC Group Delay measurements)

Example: `INP:FILT:YIG OFF`
Deactivates the YIG-preselector.

Manual operation: See "YIG-Preselector" on page 64

INPut:IMPedance <Impedance>

This command selects the nominal input impedance of the RF input.

75 Ω should be selected if the 50 Ω input impedance is transformed to a higher impedance using a matching pad of the RAZ type (= 25 Ω in series to the input impedance of the instrument). The power loss correction value in this case is 1.76 dB = 10 log (75Ω/50Ω).

The command is not available for measurements with the Digital Baseband Interface (R&S FSW-B17).

Parameters:

<Impedance> 50 | 75

*RST: 50 Ω

Example: `INP:IMP 75`

Usage: SCPI confirmed

Manual operation: See "Impedance" on page 63

INPut:SELect <Source>

This command selects the signal source for measurements, i.e. it defines which connector is used to input data to the R&S FSW. If no additional options are installed, only RF input is supported.

Parameters:

<Source>

RF
Radio Frequency ("RF INPUT" connector)

DIQ
Digital IQ data (only available with optional Digital Baseband Interface R&S FSW-B17)
For details on I/Q input see the R&S FSW I/Q Analyzer User Manual.

AIQ
Analog Baseband signal (only available with optional Analog Baseband Interface R&S FSW-B71)
For details on Analog Baseband input see the R&S FSW I/Q Analyzer User Manual.

*RST: RF

Manual operation: See "Radio Frequency State" on page 63
See "Digital I/Q Input State" on page 65
See "Analog Baseband Input State" on page 67

11.5.2.2 Remote Commands for the Digital Baseband Interface (R&S FSW-B17)

The following commands are required to control the Digital Baseband Interface (R&S FSW-B17) in a remote environment.They are only available if this option is installed.

Information on the `STATus:QUEStionable:DIQ` register can be found in "STATus:QUEStionable:DIQ Register" on page 157.

- Configuring Digital I/Q Input and Output.....153
- STATus:QUEStionable:DIQ Register.....157

Configuring Digital I/Q Input and Output

Remote commands for the R&S DigIConf software

Remote commands for the R&S DigIConf software always begin with `SOURce:EBOX`.
Such commands are passed on from the R&S FSW to the R&S DigIConf automatically which then configures the R&S EX-IQ-BOX via the USB connection.

All remote commands available for configuration via the R&S DigIConf software are described in the "R&S®EX-IQ-BOX Digital Interface Module R&S®DigIConf Software Operating Manual".

Example 1:

```
SOURce:EBOX:*RST
SOURce:EBOX:*IDN?
```

Result:

"Rohde&Schwarz,DigIConf,02.05.436 Build 47"

Example 2:

```
SOURce:EBOX:USER:CLOCk:REFerence:FREQuency 5MHZ
```

Defines the frequency value of the reference clock.

Remote commands exclusive to digital I/Q data input and output

INPut:DIQ:CDEVice....153
INPut:DIQ:RANGe[:UPPer]:AUTO....154
INPut:DIQ:RANGe:COUPling....155
INPut:DIQ:RANGe[:UPPer]....155
INPut:DIQ:RANGe[:UPPer]:UNIT....155
INPut:DIQ:SRATe....156
INPut:DIQ:SRATe:AUTO....156
OUTPut:DIQ....156
OUTPut:DIQ:CDEVice....156

INPut:DIQ:CDEVice

This command queries the current configuration and the status of the digital I/Q input from the optional Digital Baseband Interface (R&S FSW-B17).

For details see the section "Interface Status Information" for the Digital Baseband Interface (R&S FSW-B17) in the R&S FSW I/Q Analyzer User Manual.

Return values:

<ConnState> Defines whether a device is connected or not.

0
No device is connected.

1
A device is connected.

<DeviceName> Device ID of the connected device

<SerialNumber> Serial number of the connected device

<PortName> Port name used by the connected device

<SampleRate> Maximum or currently used sample rate of the connected device in Hz (depends on the used connection protocol version; indicated by <SampleRateType> parameter)

<MaxTransferRate> Maximum data transfer rate of the connected device in Hz

<ConnProtState> State of the connection protocol which is used to identify the connected device.

Not Started

Has to be Started

Started

Passed

Failed

Done

<PRBSTestState> State of the PRBS test.

Not Started

Has to be Started

Started

Passed

Failed

Done

<SampleRateType> **0**
Maximum sample rate is displayed

1
Current sample rate is displayed

<FullScaleLevel> The level (in dBm) that should correspond to an I/Q sample with the magnitude "1" (if transferred from connected device);
If not available, `9.97e37` is returned

Example:
```
INP:DIQ:CDEV?
```
Result:
```
1,SMU200A,103634,Out
A,70000000,100000000,Passed,Not Started,0,0
```

Manual operation: See "Connected Instrument" on page 66

INPut:DIQ:RANGe[:UPPer]:AUTO <State>

If enabled, the digital input full scale level is automatically set to the value provided by the connected device (if available).

This command is only available if the optional Digital Baseband interface (option R&S FSW-B17) is installed.

Parameters:
<State> ON | OFF
*RST: OFF

Manual operation: See "Full Scale Level" on page 65

INPut:DIQ:RANGe:COUPling <State>

If enabled, the reference level for digital input is adjusted to the full scale level automatically if the full scale level changes.

This command is only available if the optional Digital Baseband Interface (R&S FSW-B17) is installed.

Parameters:
<State> ON | OFF
*RST: OFF

Manual operation: See "Adjust Reference Level to Full Scale Level" on page 66

INPut:DIQ:RANGe[:UPPer] <Level>

Defines or queries the "Full Scale Level", i.e. the level that corresponds to an I/Q sample with the magnitude "1".

This command is only available if the optional Digital Baseband Interface (R&S FSW-B17) is installed.

Parameters:
<Level> <numeric value>
Range: 1 µV to 7.071 V
*RST: 1 V

Manual operation: See "Full Scale Level" on page 65

INPut:DIQ:RANGe[:UPPer]:UNIT <Unit>

Defines the unit of the full scale level (see "Full Scale Level" on page 65). The availability of units depends on the measurement application you are using.

This command is only available if the optional Digital Baseband Interface (R&S FSW-B17) is installed.

Parameters:
<Level> VOLT | DBM | DBPW | WATT | DBMV | DBUV | DBUA | AMPere
*RST: Volt

Manual operation: See "Full Scale Level" on page 65

INPut:DIQ:SRATe <SampleRate>

This command specifies or queries the sample rate of the input signal from the Digital Baseband Interface (R&S FSW-B17, see "Input Sample Rate" on page 65).

Parameters:

<SampleRate> Range: 1 Hz to 10 GHz
*RST: 32 MHz

Example: INP:DIQ:SRAT 200 MHz

Manual operation: See "Input Sample Rate" on page 65

INPut:DIQ:SRATe:AUTO <State>

If enabled, the sample rate of the digital I/Q input signal is set automatically by the connected device.

This command is only available if the optional Digital Baseband Interface (R&S FSW-B17) is installed.

Parameters:

<State> ON | OFF
*RST: OFF

Manual operation: See "Input Sample Rate" on page 65

OUTPut:DIQ <State>

This command turns continuous output of I/Q data to the Digital Baseband Interface (R&S FSW-B17) on and off.

Using the digital input and digital output simultaneously is not possible.

Parameters:

<State> ON | OFF
*RST: OFF

Example: `OUTP:DIQ ON`

Manual operation: See "Digital Baseband Output" on page 72

OUTPut:DIQ:CDEVice

This command queries the current configuration and the status of the digital I/Q data output to the optional Digital Baseband Interface (R&S FSW-B17).

Return values:

<ConnState> Defines whether a device is connected or not.

0
No device is connected.

1
A device is connected.

<DeviceName>	Device ID of the connected device
<SerialNumber>	Serial number of the connected device
<PortName>	Port name used by the connected device
<NotUsed>	to be ignored
<MaxTransferRate>	Maximum data transfer rate of the connected device in Hz
<ConnProtState>	State of the connection protocol which is used to identify the connected device. **Not Started** **Has to be Started** **Started** **Passed** **Failed** **Done**
<PRBSTestState>	State of the PRBS test. **Not Started** **Has to be Started** **Started** **Passed** **Failed** **Done**
<NotUsed>	to be ignored
<Placeholder>	for future use; currently "0"

Example:	`OUTP:DIQ:CDEV?`
	Result:
	`1,SMU200A,103634,Out A,70000000,100000000,Passed,Not Started,0,0`

Manual operation:	See "Output Settings Information" on page 72 See "Connected Instrument" on page 73

STATus:QUEStionable:DIQ Register

This register contains information about the state of the digital I/Q input and output. This register is available with option Digital Baseband Interface (R&S FSW-B17)Digital Baseband Interface (R&S FSW-B17).

The status of the `STATus:QUESTionable:DIQ` register is indicated in bit 14 of the `STATus:QUESTionable` register.

You can read out the state of the register with `STATus:QUEStionable:DIQ:CONDition?` on page 158 and `STATus:QUEStionable:DIQ[:EVENt]?` on page 159.

Bit No.	Meaning
0	**Digital I/Q Input Device connected** This bit is set if a device is recognized and connected to the Digital Baseband Interface of the analyzer.
1	**Digital I/Q Input Connection Protocol in progress** This bit is set while the connection between analyzer and digital baseband data signal source (e.g. R&S SMU, R&S Ex-I/Q-Box) is established.
2	**Digital I/Q Input Connection Protocol error** This bit is set if an error occurred during establishing of the connect between analyzer and digital I/Q data signal source (e.g. R&S SMU, R&S Ex-I/Q-Box) is established.
3-5	not used
6	**Digital I/Q Input FIFO Overload** This bit is set if the input transfer rate is too high.
7	not used
8	**Digital I/Q Output Device connected** This bit is set if a device is recognized and connected to the Digital I/Q Output.
9	**Digital I/Q Output Connection Protocol in progress** This bit is set while the connection between analyzer and digital I/Q data signal source (e.g. R&S SMU, R&S Ex-I/Q-Box) is established.
10	**Digital I/Q Output Connection Protocol error** This bit is set if an error occurred while the connection between analyzer and digital I/Q data signal source (e.g. R&S SMU, R&S Ex-I/Q-Box) is established.
11-14	not used
15	This bit is always set to 0.

STATus:QUEStionable:DIQ:CONDition?....158
STATus:QUEStionable:DIQ:ENABle....159
STATus:QUEStionable:DIQ:NTRansition....159
STATus:QUEStionable:DIQ:PTRansition....159
STATus:QUEStionable:DIQ[:EVENt]?....159

STATus:QUEStionable:DIQ:CONDition? <ChannelName>

This command reads out the CONDition section of the `STATus:QUEStionable:DIQ:CONDition` status register.

The command does not delete the contents of the EVENt section.

Query parameters:

<ChannelName> String containing the name of the channel.
The parameter is optional. If you omit it, the command works for the currently active channel.

Example: `STAT:QUES:DIQ:COND?`

Usage: Query only

STATus:QUEStionable:DIQ:ENABle <BitDefinition>, <ChannelName>

This command controls the ENABle part of a register.

The ENABle part allows true conditions in the EVENt part of the status register to be reported in the summary bit. If a bit is 1 in the enable register and its associated event bit transitions to true, a positive transition will occur in the summary bit reported to the next higher level.

Parameters:

<ChannelName> String containing the name of the channel.
The parameter is optional. If you omit it, the command works for the currently active channel.

Setting parameters:

<SumBit> Range: 0 to 65535

Usage: SCPI confirmed

STATus:QUEStionable:DIQ:NTRansition <BitDefinition>,<ChannelName>

This command controls the Negative TRansition part of a register.

Setting a bit causes a 1 to 0 transition in the corresponding bit of the associated register. The transition also writes a 1 into the associated bit of the corresponding EVENt register.

Parameters:

<ChannelName> String containing the name of the channel.
The parameter is optional. If you omit it, the command works for the currently active channel.

Setting parameters:

<BitDefinition> Range: 0 to 65535

STATus:QUEStionable:DIQ:PTRansition <BitDefinition>,<ChannelName>

This command controls the Positive TRansition part of a register.

Setting a bit causes a 0 to 1 transition in the corresponding bit of the associated register. The transition also writes a 1 into the associated bit of the corresponding EVENt register.

Parameters:

<ChannelName> String containing the name of the channel.
The parameter is optional. If you omit it, the command works for the currently active channel.

Setting parameters:

<BitDefinition> Range: 0 to 65535

STATus:QUEStionable:DIQ[:EVENt]? <ChannelName>

This command queries the contents of the "EVENt" section of the `STATus:QUEStionable:DIQ` register for IQ measurements.

Readout deletes the contents of the "EVENt" section.

Query parameters:

<ChannelName> String containing the name of the channel.
The parameter is optional. If you omit it, the command works for the currently active channel.

Example: `STAT:QUES:DIQ?`

Usage: Query only

11.5.2.3 Configuring Input via the Analog Baseband Interface (R&S FSW-B71)

The following commands are required to control the Analog Baseband Interface (R&S FSW-B71) in a remote environment.They are only available if this option is installed.

For more information on the Analog Baseband Interface see the R&S FSW I/Q Analyzer User Manual.

Useful commands for Analog Baseband data described elsewhere:

- `INP:SEL AIQ` (see `INPut:SELect` on page 152)
- `[SENSe:]FREQuency:CENTer` on page 166

Commands for the Analog Baseband calibration signal are described in the R&S FSW User Manual.

Remote commands exclusive to Analog Baseband data input and output

INPut:IQ:BALanced[:STATe]....160
INPut:IQ:FULLscale:AUTO....161
INPut:IQ:FULLscale:LEVel....161
INPut:IQ:TYPE....161
[SENSe:]SWAPiq....162

INPut:IQ:BALanced[:STATe] <State>

This command defines whether the input is provided as a differential signal via all 4 Analog Baseband connectors or as a plain I/Q signal via 2 simple-ended lines.

Parameters:

<State> **ON**
Differential
OFF
Simple-ended
*RST: ON

Example: `INP:IQ:BAL OFF`

Manual operation: See "Input configuration" on page 68

INPut:IQ:FULLscale:AUTO <State>

This command defines whether the fullscale level (i.e. the maximum input power on the Baseband Input connector) is defined automatically according to the reference level, or manually.

Parameters:

<State>

ON
Automatic definition

OFF
Manual definition according to `INPut:IQ:FULLscale:LEVel` on page 161

*RST: ON

Example: `INP:IQ:FULL:AUTO OFF`

Manual operation: See "Fullscale Level Mode / Value" on page 80

INPut:IQ:FULLscale:LEVel <PeakVoltage>

This command defines the peak voltage at the Baseband Input connector if the fullscale level is set to manual mode (see `INPut:IQ:FULLscale:AUTO` on page 161).

Parameters:

<PeakVoltage>

0.25 V | 0.5 V | 1 V | 2 V

Peak voltage level at the connector.
For probes, the possible fullscale values are adapted according to the probe's attenuation and maximum allowed power.

*RST: 1V

Example: `INP:IQ:FULL 0.5V`

Manual operation: See "Fullscale Level Mode / Value" on page 80

INPut:IQ:TYPE <DataType>

This command defines the format of the input signal.

Parameters:

<DataType> IQ | I | Q

IQ
The input signal is filtered and resampled to the sample rate of the application.
Two input channels are required for each input signal, one for the in-phase component, and one for the quadrature component.

I
The in-phase component of the input signal is filtered and resampled to the sample rate of the application. If the center frequency is not 0 (see `[SENSe:]FREQuency:CENTer` on page 166), the in-phase component of the input signal is down-converted first (Low IF I).

Q
The quadrature component of the input signal is filtered and resampled to the sample rate of the application. If the center frequency is not 0 (see `[SENSe:]FREQuency:CENTer` on page 166), the quadrature component of the input signal is down-converted first (Low IF Q).

*RST: IQ

Example: `INP:IQ:TYPE Q`

Manual operation: See "I/Q Mode" on page 67

[SENSe:]SWAPiq <State>

This command defines whether or not the recorded IQ pairs should be swapped (I<->Q) before being processed. Swapping I and Q inverts the sideband.

This is useful if the DUT interchanged the I and Q parts of the signal; then the R&S FSW can do the same to compensate for it.

Parameters:

<State> **ON**
I and Q signals are interchanged
Inverted sideband, Q+j*I

OFF
I and Q signals are not interchanged
Normal sideband, I+j*Q

*RST: OFF

Manual operation: See "Swap I/Q" on page 68

11.5.2.4 Setting up Probes

Probes can be connected to the optional BASEBAND INPUT connectors, if the Analog Baseband interface (option R&S FSW-B71) is installed.

[SENSe:]PROBe<p>:ID:PARTnumber?....163
[SENSe:]PROBe<p>:ID:SRNumber?....163
[SENSe:]PROBe<p>:SETup:MODE....163
[SENSe:]PROBe<p>:SETup:NAME?....164
[SENSe:]PROBe<p>:SETup:STATe?....164
[SENSe:]PROBe<p>:SETup:TYPE?....165

[SENSe:]PROBe<p>:ID:PARTnumber?

Queries the R&S part number of the probe.

Suffix:

<p> 1 | 2 | 3
Selects the connector:
1 = Baseband Input I
2 = Baseband Input Q
3 = RF (currently not supported; use "1" with RF Input Connector setting "Baseband Input I")

Return values:

<PartNumber> Part number in a string.

Usage: Query only

[SENSe:]PROBe<p>:ID:SRNumber?

Queries the serial number of the probe.

Suffix:

<p> 1 | 2 | 3
Selects the connector:
1 = Baseband Input I
2 = Baseband Input Q
3 = RF (currently not supported; use "1" with RF Input Connector setting "Baseband Input I")

Return values:

<SerialNo> Serial number in a string.

Usage: Query only

[SENSe:]PROBe<p>:SETup:MODE <Mode>

Select the action that is started with the micro button on the probe head.

See also: "Microbutton Action" on page 69.

Suffix:
<p> 1 | 2 | 3
Selects the connector:
1 = Baseband Input I
2 = Baseband Input Q
3 = RF (currently not supported; use "1" with RF Input Connector setting "Baseband Input I")

Parameters:
<Mode> **RSINgle**
Run single: starts one data acquisition.

NOACtion
Nothing is started on pressing the micro button.

*RST: RSINgle

Manual operation: See "Microbutton Action" on page 69

[SENSe:]PROBe<p>:SETup:NAME?

Queries the name of the probe.

Suffix:
<p> 1 | 2 | 3
Selects the connector:
1 = Baseband Input I
2 = Baseband Input Q
3 = RF (currently not supported; use "1" with RF Input Connector setting "Baseband Input I")

Return values:
<Name> Name string

Usage: Query only

[SENSe:]PROBe<p>:SETup:STATe?

Queries if the probe at the specified connector is active (detected) or not active (not detected). To switch the probe on, i.e. activate input from the connector, use `INP:SEL:AIQ` (see `INPut:SELect` on page 152).

Suffix:
<p> 1 | 2 | 3
Selects the connector:
1 = Baseband Input I
2 = Baseband Input Q
3 = RF (currently not supported; use "1" with RF Input Connector setting "Baseband Input I")

Return values:
<State> DETected | NDETected

*RST: NDETected

Usage: Query only

[SENSe:]PROBe<p>:SETup:TYPE?

Queries the type of the probe.

Suffix:

<p> 1 | 2 | 3
Selects the connector:
1 = Baseband Input I
2 = Baseband Input Q
3 = RF (currently not supported; use "1" with RF Input Connector setting "Baseband Input I")

Return values:

<Type> String containing one of the following values:
– None (no probe detected)
– active differential
– active single-ended

Usage: Query only

11.5.2.5 Configuring the Outputs

Configuring trigger input/output is described in chapter 11.5.4.2, "Configuring the Trigger Output", on page 180.

DIAGnostic:SERVice:NSOurce.....165

DIAGnostic:SERVice:NSOurce <State>

This command turns the 28 V supply of the BNC connector labeled NOISE SOURCE CONTROL on the front panel on and off.

Parameters:

<State> ON | OFF
*RST: OFF

Example: `DIAG:SERV:NSO ON`

Manual operation: See "Noise Source" on page 70

11.5.3 Frontend Configuration

The following commands configure frequency, amplitude and y-axis scaling settings, which represent the "frontend" of the measurement setup.

For more information see chapter 6.2.5, "Frontend Settings", on page 73.

- Frequency....166
- Amplitude and Scaling Settings....168
- Configuring the Attenuation....171

11.5.3.1 Frequency

[SENSe:]FREQuency:CENTer....166
[SENSe:]FREQuency:CENTer:STEP....166
[SENSe:]FREQuency:CENTer:STEP:AUTO....167
[SENSe:]FREQuency:CENTer:STEP:LINK....167
[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor....167
[SENSe:]FREQuency:OFFSet....168

[SENSe:]FREQuency:CENTer <Frequency>

This command defines the center frequency.

Parameters:

<Frequency> The allowed range and f_{max} is specified in the data sheet.

UP
Increases the center frequency by the step defined using the `[SENSe:]FREQuency:CENTer:STEP` command.

DOWN
Decreases the center frequency by the step defined using the `[SENSe:]FREQuency:CENTer:STEP` command.

*RST: fmax/2
Default unit: Hz

Example:

```
FREQ:CENT 100 MHz
FREQ:CENT:STEP 10 MHz
FREQ:CENT UP
```

Sets the center frequency to 110 MHz.

Usage: SCPI confirmed

Manual operation: See "Center Frequency" on page 68
See "Center" on page 74

[SENSe:]FREQuency:CENTer:STEP <StepSize>

This command defines the center frequency step size.

You can increase or decrease the center frequency quickly in fixed steps using the `SENS:FREQ UP` AND `SENS:FREQ DOWN` commands, see `[SENSe:]FREQuency:CENTer` on page 166.

Parameters:

<StepSize> f_{max} is specified in the data sheet.

Range: 1 to fMAX
*RST: 0.1 x span
Default unit: Hz

Example:
```
FREQ:CENT 100 MHz
FREQ:CENT:STEP 10 MHz
FREQ:CENT UP
```
Sets the center frequency to 110 MHz.

Manual operation: See "Center Frequency Stepsize" on page 74

[SENSe:]FREQuency:CENTer:STEP:AUTO <State>

This command couples or decouples the center frequency step size to the span.

Parameters:

<State> ON | OFF | 0 | 1

*RST: 1

Example:
```
FREQ:CENT:STEP:AUTO ON
```
Activates the coupling of the step size to the span.

[SENSe:]FREQuency:CENTer:STEP:LINK <CouplingType>

This command couples and decouples the center frequency step size to the span or the resolution bandwidth.

Parameters:

<CouplingType>

SPAN
Couples the step size to the span. Available for measurements in the frequency domain.

RBW
Couples the step size to the resolution bandwidth. Available for measurements in the time domain.

OFF
Decouples the step size.

*RST: SPAN

Example:
```
FREQ:CENT:STEP:LINK SPAN
```

[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor <Factor>

This command defines a step size factor if the center frequency step size is coupled to the span or the resolution bandwidth.

Parameters:

<Factor> 1 to 100 PCT

*RST: 10

Example: `FREQ:CENT:STEP:LINK:FACT 20PCT`

[SENSe:]FREQuency:OFFSet <Offset>

This command defines a frequency offset.

If this value is not 0 Hz, the application assumes that the input signal was frequency shifted outside the application. All results of type "frequency" will be corrected for this shift numerically by the application.

See also "Frequency Offset" on page 74.

Parameters:

<Offset> Range: -100 GHz to 100 GHz
*RST: 0 Hz

Example: `FREQ:OFFS 1GHZ`

Usage: SCPI confirmed

Manual operation: See "Frequency Offset" on page 74

11.5.3.2 Amplitude and Scaling Settings

Useful commands for amplitude settings described elsewhere:

- `INPut:COUPling` on page 150
- `INPut:IMPedance` on page 151
- `[SENSe:]ADJust:LEVel` on page 194

Remote commands exclusive to amplitude settings:

CALCulate<n>:UNIT:POWer....168
DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:AUTO ONCE....169
DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:MAXimum....169
DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:MINimum....169
DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:PDIVision....169
DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:RLEVel....170
DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:RLEVel:OFFSet....170
INPut:GAIN:STATe....170
INPut:GAIN[:VALue]....171

CALCulate<n>:UNIT:POWer <Unit>

This command selects the unit of the y-axis.

The unit applies to all measurement windows.

Parameters:

<Unit> DBM | V | A | W | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMPere
*RST: dBm

Example: `CALC:UNIT:POW DBM`
Sets the power unit to dBm.

DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:AUTO ONCE

Automatic scaling of the y-axis is performed once, then switched off again.

Usage: SCPI confirmed

Manual operation: See "Auto Scale Once" on page 81

DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:MAXimum <Value>

This command defines the maximum value of the y-axis for the selected result display.

Parameters:
<Value> <numeric value>
*RST: depends on the result display
The unit and range depend on the result display.

Example:
```
DISP:TRAC:Y:MIN -60
DISP:TRAC:Y:MAX 0
```
Defines the y-axis with a minimum value of -60 and maximum value of 0.

Manual operation: See "Y-Maximum, Y-Minimum" on page 81

DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:MINimum <Value>

This command defines the minimum value of the y-axis for the selected result display.

Parameters:
<Value> <numeric value>
*RST: depends on the result display
The unit and range depend on the result display.

Example:
```
DISP:TRAC:Y:MIN -60
DISP:TRAC:Y:MAX 0
```
Defines the y-axis with a minimum value of -60 and maximum value of 0.

Manual operation: See "Y-Maximum, Y-Minimum" on page 81

DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:PDIVision <Value>

This remote command determines the grid spacing on the Y-axis for all diagrams, where possible.

Parameters:
<Value> numeric value; the unit depends on the result display
Defines the range per division (total range = 10*<Value>)
*RST: depends on the result display

Example: `DISP:TRAC:Y:PDIV 10`
Sets the grid spacing to 10 units (e.g. dB) per division
(For example 10 dB in the Code Domain Power result display.)

DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:RLEVel <ReferenceLevel>

This command defines the reference level.

With a reference level offset ≠ 0, the value range of the reference level is modified by the offset.

Parameters:
<ReferenceLevel> The unit is variable.
Range: see datasheet
*RST: 0 dBm

Example: `DISP:TRAC:Y:RLEV -60dBm`

Usage: SCPI confirmed

Manual operation: See "Reference Level" on page 76

DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:RLEVel:OFFSet <Offset>

This command defines a reference level offset.

Parameters:
<Offset> Range: -200 dB to 200 dB
*RST: 0dB

Example: `DISP:TRAC:Y:RLEV:OFFS -10dB`

Manual operation: See "Reference Level" on page 76
See "Shifting the Display (Offset)" on page 76

INPut:GAIN:STATe <State>

This command turns the preamplifier on and off.

The command requires option R&S FSW-B24.

This function is not available for input from the Digital Baseband Interface (R&S FSW-B17).

Parameters:
<State> ON | OFF
*RST: OFF

Example: `INP:GAIN:STAT ON`
Switches on 30 dB preamplification.

Usage: SCPI confirmed

Manual operation: See "Input Settings" on page 78
See "Preamplifier (option B24)" on page 78

INPut:GAIN[:VALue] <Gain>

This command selects the preamplification level if the preamplifier is activated (`INP:GAIN:STAT ON`, see `INPut:GAIN:STATe` on page 170).

The command requires option R&S FSW-B24.

Parameters:

<Gain> 15 dB | 30 dB

The availability of preamplification levels depends on the R&S FSW model.
- R&S FSW8: 15dB and 30 dB
- R&S FSW13: 15dB and 30 dB
- R&S FSW26: 30 dB

All other values are rounded to the nearest of these two.

*RST: OFF

Example: `INP:GAIN:VAL 30`
Switches on 30 dB preamplification.

Usage: SCPI confirmed

Manual operation: See "Input Settings" on page 78
See "Preamplifier (option B24)" on page 78

11.5.3.3 Configuring the Attenuation

INPut:ATTenuation....171
INPut:ATTenuation:AUTO....172
INPut:EATT....172
INPut:EATT:AUTO....173
INPut:EATT:STATe....173

INPut:ATTenuation <Attenuation>

This command defines the total attenuation for RF input.

If an electronic attenuator is available and active, the command defines a mechanical attenuation (see `INPut:EATT:STATe` on page 173).

If you set the attenuation manually, it is no longer coupled to the reference level, but the reference level is coupled to the attenuation. Thus, if the current reference level is not compatible with an attenuation that has been set manually, the command also adjusts the reference level.

This function is not available if the Digital Baseband Interface (R&S FSW-B17) is active.

Parameters:

<Attenuation> Range: see data sheet
Increment: 5 dB
*RST: 10 dB (AUTO is set to ON)

Example: `INP:ATT 30dB`
Defines a 30 dB attenuation and decouples the attenuation from the reference level.

Usage: SCPI confirmed

Manual operation: See "RF Attenuation" on page 77
See "Attenuation Mode / Value" on page 77

INPut:ATTenuation:AUTO <State>

This command couples or decouples the attenuation to the reference level. Thus, when the reference level is changed, the R&S FSW determines the signal level for optimal internal data processing and sets the required attenuation accordingly.

This function is not available if the Digital Baseband Interface (R&S FSW-B17) is active.

Parameters:
<State> ON | OFF | 0 | 1
*RST: 1

Example: `INP:ATT:AUTO ON`
Couples the attenuation to the reference level.

Usage: SCPI confirmed

Manual operation: See "RF Attenuation" on page 77
See "Attenuation Mode / Value" on page 77

INPut:EATT <Attenuation>

This command defines an electronic attenuation manually. Automatic mode must be switched off (`INP:EATT:AUTO OFF`, see `INPut:EATT:AUTO` on page 173).

If the current reference level is not compatible with an attenuation that has been set manually, the command also adjusts the reference level.

This command is only available with option R&S FSW-B25.

It is not available if R&S FSW-B17 is active.

Parameters:
<Attenuation> attenuation in dB
Range: see data sheet
Increment: 1 dB
*RST: 0 dB (OFF)

Example:
```
INP:EATT:AUTO OFF
INP:EATT 10 dB
```

Manual operation: See "Using Electronic Attenuation (Option B25)" on page 77

INPut:EATT:AUTO <State>

This command turns automatic selection of the electronic attenuation on and off.

If on, electronic attenuation reduces the mechanical attenuation whenever possible.

This command is only available with option R&S FSW-B25.

It is not available if R&S FSW-B17 is active.

Parameters:

<State> ON | OFF | 0 | 1

*RST: 1

Example: `INP:EATT:AUTO OFF`

Manual operation: See "Using Electronic Attenuation (Option B25)" on page 77

INPut:EATT:STATe <State>

This command turns the electronic attenuator on and off.

This command is only available with option R&S FSW-B25.

It is not available if R&S FSW-B17 is active.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `INP:EATT:STAT ON`

Switches the electronic attenuator into the signal path.

Manual operation: See "Using Electronic Attenuation (Option B25)" on page 77

11.5.4 Configuring Triggered Measurements

The following commands are required to configure a triggered measurement in a remote environment. The tasks for manual operation are described in chapter 6.2.6, "Trigger Settings", on page 81.

The `*OPC` command should be used after commands that retrieve data so that subsequent commands to change the selected trigger source are held off until after the sweep is completed and the data has been returned.

- Configuring the Triggering Conditions.....174
- Configuring the Trigger Output.....180

11.5.4.1 Configuring the Triggering Conditions

TRIGger[:SEQuence]:BBPower:HOLDoff....174
TRIGger[:SEQuence]:DTIMe....174
TRIGger[:SEQuence]:HOLDoff[:TIME]....175
TRIGger[:SEQuence]:IFPower:HOLDoff....175
TRIGger[:SEQuence]:IFPower:HYSTeresis....175
TRIGger[:SEQuence]:LEVel:BBPower....176
TRIGger[:SEQuence]:LEVel[:EXTernal<port>]....176
TRIGger[:SEQuence]:LEVel:IFPower....176
TRIGger[:SEQuence]:LEVel:IQPower....177
TRIGger[:SEQuence]:LEVel:RFPower....177
TRIGger[:SEQuence]:LEVel:VIDeo....177
TRIGger[:SEQuence]:SLOPe....177
TRIGger[:SEQuence]:SOURce....178
TRIGger[:SEQuence]:TIME:RINTerval....180

TRIGger[:SEQuence]:BBPower:HOLDoff <Period>

This command defines the holding time before the baseband power trigger event.

The command requires the **Digital Baseband Interface (R&S FSW-B17)** or the **Analog Baseband Interface (R&S FSW-B71)**.

Note that this command is maintained for compatibility reasons only. Use the `TRIGger[:SEQuence]:IFPower:HOLDoff` on page 175 command for new remote control programs.

Parameters:

<Period>
Range: 150 ns to 1000 s
*RST: 150 ns

Example:
```
TRIG:SOUR BBP
```
Sets the baseband power trigger source.
```
TRIG:BBP:HOLD 200 ns
```
Sets the holding time to 200 ns.

TRIGger[:SEQuence]:DTIMe <DropoutTime>

Defines the time the input signal must stay below the trigger level before a trigger is detected again.

For input from the Analog Baseband Interface (R&S FSW-B71) using the baseband power trigger (BBP), the default drop out time is set to 100 ns to avoid unintentional trigger events (as no hysteresis can be configured in this case).

Parameters:

<DropoutTime>
Dropout time of the trigger.

Range: 0 s to 10.0 s
*RST: 0 s

Manual operation: See "Trigger Source" on page 83
See "Drop-Out Time" on page 85

TRIGger[:SEQuence]:HOLDoff[:TIME] <Offset>

Defines the time offset between the trigger event and the start of the sweep (data capturing).

Parameters:
<Offset> *RST: 0 s

Example: `TRIG:HOLD 500us`

Manual operation: See "Trigger Source" on page 83
See "Trigger Offset" on page 85

TRIGger[:SEQuence]:IFPower:HOLDoff <Period>

This command defines the holding time before the next trigger event.

Note that this command is available for **any trigger source**, not just IF Power.

Note: If you perform gated measurements in combination with the IF Power trigger, the R&S FSW ignores the holding time for frequency sweep, FFT sweep, zero span and I/Q data measurements.

Parameters:
<Period> *RST: 150 ns

Example: `TRIG:SOUR IFP`
Sets the IF power trigger source.
`TRIG:IFP:HOLD 200 ns`
Sets the holding time to 200 ns.

Manual operation: See "Trigger Source" on page 83
See "Trigger Holdoff" on page 85

TRIGger[:SEQuence]:IFPower:HYSTeresis <Hysteresis>

This command defines the trigger hysteresis, which is only available for "IF Power" trigger sources.

Parameters:
<Hysteresis> Range: 3 dB to 50 dB
*RST: 3 dB

Example: `TRIG:SOUR IFP`
Sets the IF power trigger source.
`TRIG:IFP:HYST 10DB`
Sets the hysteresis limit value.

Manual operation: See "Trigger Source" on page 83
See "Hysteresis" on page 85

TRIGger[:SEQuence]:LEVel:BBPower <Level>

This command sets the level of the baseband power trigger.

This command is available for the **Digital Baseband Interface (R&S FSW-B17)** and the **Analog Baseband Interface (R&S FSW-B71)**.

Parameters:

<Level> Range: -50 dBm to +20 dBm
*RST: -20 DBM

Example: `TRIG:LEV:BB -30DBM`

Manual operation: See "Trigger Source" on page 83
See "Trigger Level" on page 84

TRIGger[:SEQuence]:LEVel[:EXTernal<port>] <TriggerLevel>

This command defines the level the external signal must exceed to cause a trigger event.

Note that the variable INPUT/OUTPUT connectors (ports 2+3) must be set for use as input using the `OUTPut:TRIGger<port>:DIRection` command.

Suffix:

<port> 1 | 2 | 3
Selects the trigger port.
1 = trigger port 1 (TRIGGER INPUT connector on front panel)
2 = trigger port 2 (TRIGGER INPUT/OUTPUT connector on front panel)
3 = trigger port 3 (TRIGGER3 INPUT/OUTPUT connector on rear panel)

Parameters:

<TriggerLevel> Range: 0.5 V to 3.5 V
*RST: 1.4 V

Example: `TRIG:LEV 2V`

Manual operation: See "Trigger Source" on page 83
See "Trigger Level" on page 84

TRIGger[:SEQuence]:LEVel:IFPower <TriggerLevel>

This command defines the power level at the third intermediate frequency that must be exceeded to cause a trigger event. Note that any RF attenuation or preamplification is considered when the trigger level is analyzed.

For compatibility reasons, this command is also available for the "baseband power" trigger source when using the Analog Baseband Interface (R&S FSW-B71).

Parameters:

<TriggerLevel> Range: -50 dBm to 20 dBm
*RST: -20 dBm

Example: `TRIG:LEV:IFP -30DBM`

TRIGger[:SEQuence]:LEVel:IQPower <TriggerLevel>

This command defines the magnitude the I/Q data must exceed to cause a trigger event. Note that any RF attenuation or preamplification is considered when the trigger level is analyzed.

Parameters:

<TriggerLevel> Range: -130 dBm to 30 dBm
*RST: -20 dBm

Example: `TRIG:LEV:IQP -30DBM`

TRIGger[:SEQuence]:LEVel:RFPower <TriggerLevel>

This command defines the power level the RF input must exceed to cause a trigger event. Note that any RF attenuation or preamplification is considered when the trigger level is analyzed.

The input signal must be between 500 MHz and 8 GHz.

Parameters:

<TriggerLevel> Range: -50 dBm to -10 dBm
*RST: -20 dBm

Example: `TRIG:LEV:RFP -30dBm`

TRIGger[:SEQuence]:LEVel:VIDeo <Level>

This command defines the level the video signal must exceed to cause a trigger event. Note that any RF attenuation or preamplification is considered when the trigger level is analyzed.

Parameters:

<Level> Range: 0 PCT to 100 PCT
*RST: 50 PCT

Example: `TRIG:LEV:VID 50PCT`

TRIGger[:SEQuence]:SLOPe <Type>

For all trigger sources except time you can define whether triggering occurs when the signal rises to the trigger level or falls down to it.

Parameters:

<Type> POSitive | NEGative

POSitive
Triggers when the signal rises to the trigger level (rising edge).

NEGative
Triggers when the signal drops to the trigger level (falling edge).

*RST: POSitive

Example: `TRIG:SLOP NEG`

Manual operation: See "Trigger Source" on page 83
See "Slope" on page 85

TRIGger[:SEQuence]:SOURce <Source>

This command selects the trigger source.

Note on external triggers:

If a measurement is configured to wait for an external trigger signal in a remote control program, remote control is blocked until the trigger is received and the program can continue. Make sure this situation is avoided in your remote control programs.

Parameters:

<Source>

IMMediate
Free Run

EXTernal
Trigger signal from the TRIGGER INPUT connector.

EXT2
Trigger signal from the TRIGGER INPUT/OUTPUT connector.
Note: Connector must be configured for "Input".

EXT3
Trigger signal from the TRIGGER 3 INPUT/ OUTPUT connector.
Note: Connector must be configured for "Input".

RFPower
First intermediate frequency
(Frequency and time domain measurements only.)
Not available for input from the Digital Baseband Interface (R&S FSW-B17) or the Analog Baseband Interface (R&S FSW-B71).

IFPower
Second intermediate frequency
(For frequency and time domain measurements only.)
Not available for input from the Digital Baseband Interface (R&S FSW-B17). For input from the Analog Baseband Interface (R&S FSW-B71), this command is interpreted as `BBPower` for compatibility reasons.

TIME
Time interval
(For frequency and time domain measurements only.)

PSEN
External power sensor
(For frequency and time domain measurements only.)

GP0 | GP1 | GP2 | GP3 | GP4 | GP5
For applications that process I/Q data, such as the I/Q Analyzer or optional applications, and only if the Digital Baseband Interface (R&S FSW-B17) is available.
Defines triggering of the measurement directly via the LVDS connector. The parameter specifies which general purpose bit (0 to 5) will provide the trigger data.
The assignment of the general purpose bits used by the Digital IQ trigger to the LVDS connector pins is provided in "Digital I/Q" on page 84.

*RST: IMMediate

Example:

```
TRIG:SOUR EXT
```

Selects the external trigger input as source of the trigger signal

Manual operation: See "Trigger Source" on page 83
See "Trigger Source" on page 83
See "Free Run" on page 83
See "External Trigger 1/2/3" on page 83
See "Digital I/Q" on page 84
See "IF Power" on page 84

TRIGger[:SEQuence]:TIME:RINTerval <Interval>

This command defines the repetition interval for the time trigger.

Parameters:
<Interval> 2.0 ms to 5000
Range: 2 ms to 5000 s
*RST: 1.0 s

Example: `TRIG:SOUR TIME`
Selects the time trigger input for triggering.
`TRIG:TIME:RINT 50`
The sweep starts every 50 s.

11.5.4.2 Configuring the Trigger Output

The following commands are required to send the trigger signal to one of the variable TRIGGER INPUT/OUTPUT connectors. The tasks for manual operation are described in "Trigger 2/3" on page 70.

OUTPut:TRIGger<port>:DIRection....180
OUTPut:TRIGger<port>:LEVel....181
OUTPut:TRIGger<port>:OTYPe....181
OUTPut:TRIGger<port>:PULSe:IMMediate....181
OUTPut:TRIGger<port>:PULSe:LENGth....182

OUTPut:TRIGger<port>:DIRection <Direction>

This command selects the trigger direction.

Suffix:
<port> 2 | 3
Selects the trigger port to which the output is sent.
2 = trigger port 2 (front)
3 = trigger port 3 (rear)

Parameters:
<Direction> **INPut**
Port works as an input.
OUTPut
Port works as an output.
*RST: INPut

Manual operation: See "Trigger 2/3" on page 70

OUTPut:TRIGger<port>:LEVel <Level>

This command defines the level of the signal generated at the trigger output.

This command works only if you have selected a user defined output with `OUTPut:TRIGger<port>:OTYPe`.

Suffix:
<port> 2 | 3
Selects the trigger port to which the output is sent.
2 = trigger port 2 (front)
3 = trigger port 3 (rear)

Parameters:
<Level> **HIGH**
TTL signal.

LOW
0 V

*RST: LOW

Manual operation: See "Trigger 2/3" on page 70
See "Output Type" on page 71
See "Level" on page 71

OUTPut:TRIGger<port>:OTYPe <OutputType>

This command selects the type of signal generated at the trigger output.

Suffix:
<port> 2 | 3
Selects the trigger port to which the output is sent.
2 = trigger port 2 (front)
3 = trigger port 3 (rear)

Parameters:
<OutputType> **DEVice**
Sends a trigger signal when the R&S FSW has triggered internally.

TARMed
Sends a trigger signal when the trigger is armed and ready for an external trigger event.

UDEFined
Sends a user defined trigger signal. For more information see `OUTPut:TRIGger<port>:LEVel`.

*RST: DEVice

Manual operation: See "Trigger 2/3" on page 70
See "Output Type" on page 71

OUTPut:TRIGger<port>:PULSe:IMMediate

This command generates a pulse at the trigger output.

Suffix:
<port> 2 | 3
Selects the trigger port to which the output is sent.
2 = trigger port 2 (front)
3 = trigger port 3 (rear)

Usage: Event

Manual operation: See "Trigger 2/3" on page 70
See "Output Type" on page 71
See "Send Trigger" on page 71

OUTPut:TRIGger<port>:PULSe:LENGth <Length>

This command defines the length of the pulse generated at the trigger output.

Suffix:
<port> 2 | 3
Selects the trigger port to which the output is sent.
2 = trigger port 2 (front)
3 = trigger port 3 (rear)

Parameters:
<Length> Pulse length in seconds.

Manual operation: See "Trigger 2/3" on page 70
See "Output Type" on page 71
See "Pulse Length" on page 71

11.5.5 Signal Capturing

The following commands configure how much and how data is captured from the input signal.

MSRA operating mode
In MSRA operating mode, only the MSRA Master channel actually captures data from the input signal. The data acquisition commands for the CDMA2000 application in MSRA mode define the **application data** (see chapter 11.12, "Configuring the Application Data Range (MSRA mode only)", on page 246).

For details on the MSRA operating mode see the R&S FSW MSRA User Manual.

[SENSe:]CDPower:IQLength....182
[SENSe:]CDPower:QINVert....183
[SENSe:]CDPower:SET:COUNt....183

[SENSe:]CDPower:IQLength <CaptureLength>

This command sets the capture length in multiples of the power control group.

Parameters:
<CaptureLength> Range: 2 to 64
*RST: 3

Example: `SENS:CDP:IQLength 3`

Manual operation: See "Number of PCGs" on page 88

[SENSe:]CDPower:QINVert <State>

This command inverts the Q component of the signal.

Parameters:
ON | OFF *RST: OFF

Example: `CDP:QINV ON`
Activates inversion of Q component.

Manual operation: See "Invert Q" on page 88

[SENSe:]CDPower:SET:COUNt <NumberSets>

This command sets the number of sets to be captured and stored in the instrument's memory. Refer to "Number of Sets" on page 88 for more information.

Parameters:
<NumberSets> Range: 1 to 1500 (BTS mode) or 810 (MS mode)
*RST: 1

Example: `CDP:SET:COUN 10`
Sets the number of sets to be captured to 10.

Manual operation: See "Number of Sets" on page 88

11.5.6 Channel Detection

The channel detection settings determine which channels are found in the input signal. The commands for working with channel tables are described here.

When the channel type is required as a parameter by a remote command or provided as a result for a remote query, the following abbreviations and assignments to a numeric value are used:

Table 11-2: BTS channel types and their assignment to a numeric parameter value

Parameter	Channel type
0	PICH
1	SYNC
2	PCH
3	TDPICH
4	APICH

Parameter	Channel type
5	ATDPICH
6	BCH
7	CPCCH
8	CACH
9	CCCH
10	CHAN
11	INACTIVE
12	PDCCH
13	PDCH

Table 11-3: Allowed RC values depending on channel type for BTS measurements

RC	Channel type	Modulation
0	all special channels (not CHAN, PDCH)	
1 | 2 | 3 | 4 | 5	CHAN	
10	PDCH	QPSK
20	PDCH	8PSK
30	PDCH	16QAM

Table 11-4: MS channel types and their assignment to a numeric parameter value

Parameter	Channel type
0	PICH
1	EACH
2	CCCH
3	DCCH
4	ACKCH
5	CQICH
6	FCH
7	S1CH
8	S2CH
9	INACTIVE

- General Channel Detection....185
- Managing Channel Tables....185
- Configuring Channel Tables....188

11.5.6.1 General Channel Detection

The following commands configure how channels are detected in general.

Useful commands for general channel detection described elsewhere:

- `CONFigure:CDPower[:BTS]:CTABle[:STATe]` on page 187
- `CONFigure:CDPower[:BTS]:CTABle:SELect` on page 187

Remote commands exclusive to general channel detection:

[SENSe:]CDPower:ICTReshold....185

[SENSe:]CDPower:ICTReshold <ThresholdLevel>

This command defines the minimum power that a single channel must have compared to the total signal in order to be regarded as an active channel. Channels below the specified threshold are regarded as "inactive".

Parameters:

<ThresholdLevel> Range: -100 dB to 0 dB
*RST: -60 dB

Example: `CDP:ICTR -50`
Sets the Inactice Channel Threshold to -50 dB.

Manual operation: See "Inactive Channel Threshold" on page 90

11.5.6.2 Managing Channel Tables

CONFigure:CDPower[:BTS]:CTABle:CATalog?....185
CONFigure:CDPower[:BTS]:CTABle:COPY....186
CONFigure:CDPower[:BTS]:CTABle:DELete....187
CONFigure:CDPower[:BTS]:CTABle:RESTore....187
CONFigure:CDPower[:BTS]:CTABle:SELect....187
CONFigure:CDPower[:BTS]:CTABle[:STATe]....187

CONFigure:CDPower[:BTS]:CTABle:CATalog?

This command reads out the names of all channel tables stored on the instrument. The first two result values are global values for all channel tables, the subsequent values are listed for each individual table.

Return values:

<TotalSize> Sum of file sizes of all channel table files (in bytes)

<FreeMem> Available memory left on hard disk (in bytes)

<FileName> File name of individual channel table file

<FileSize> File size of individual channel table file (in bytes)

Example: `CONF:CDP:CTAB:CAT?`
Sample result (description see table below):
`52853,2634403840,3GB_1_16.XML,`
`3469,3GB_1_32.XML,5853,3GB_1_64.XML,`
`10712,3GB_2.XML,1428,3GB_3_16.XML,`
`3430,3GB_3_32.XML,5868,3GB_4.XML,`
`678,3GB_5_2.XML,2554,3GB_5_4.XML,`
`4101,3GB_5_8.XML,7202,3GB_6.XML,`
`7209,MYTABLE.XML,349`

Usage: Query only

Manual operation: See "Predefined Tables" on page 91

Table 11-5: Description of query results in example:

Value	Description
52853	Total size of all channel table files: 52583 bytes
2634403840	Free memory on hard disk: 2.6 Gbytes
3GB_1_16.XML	Channel table 1: `3GB_1_16.XML`
3469	File size for channel table 1: 3469 bytes
3GB_1_32.XML	Channel table 2: `3GB_1_32.XML`
5853	File size for channel table 2: 5853 bytes
3GB_1_64.XML	Channel table 3: `3GB_1_64.XML`
10712	File size for channel table 3: 10712 bytes
...	Channel table x: ...

CONFigure:CDPower[:BTS]:CTABle:COPY <FileName>

This command copies one channel table into another one. The channel table to be copied is selected with command `CONFigure:CDPower[:BTS]:CTABle:NAME` on page 191.

Parameters:

<FileName> string with a maximum of 8 characters
name of the new channel table

Example: `CONF:CDP:CTAB:NAME 'NEW_TAB'`
Defines the channel table name to be copied.
`CONF:CDP:CTAB:COPY 'CTAB_2'`
Copies channel table 'NEW_TAB' to 'CTAB_2'.

Usage: Event

Manual operation: See "Copying a Table" on page 92

CONFigure:CDPower[:BTS]:CTABle:DELete

This command deletes the selected channel table. The channel table to be deleted is selected with the command `CONFigure:CDPower[:BTS]:CTABle:NAME` on page 191.

Example: `CONF:CDP:CTAB:NAME 'NEW_TAB'`
Defines the channel table name to be deleted.
`CONF:CDP:CTAB:DEL`
Deletes the table.

Manual operation: See "Deleting a Table" on page 92

CONFigure:CDPower[:BTS]:CTABle:RESTore

This command restores the predefined channel tables to their factory-set values. In this way, you can undo unintentional overwriting.

Example: `CONF:CDP:CTAB:REST`
Restores the channel table.

Usage: Event

Manual operation: See "Restoring Default Tables" on page 92

CONFigure:CDPower[:BTS]:CTABle:SELect <FileName>

This command selects a predefined channel table file for comparison during channel detection.

Before using this command, the channel table must be switched on first with the command `CONFigure:CDPower[:BTS]:CTABle[:STATe]` on page 187.

Parameters:
<FileName> *RST: RECENT

Example: `CONF:CDP:CTAB ON`
Switches the channel table on.
`CONF:CDP:CTAB:SEL 'CTAB_1'`
Selects the predefined channel table 'CTAB_1'.

Manual operation: See "Selecting a Table" on page 91

CONFigure:CDPower[:BTS]:CTABle[:STATe] <State>

This command switches the channel table on or off.

When switched on, the measured channel table is stored under the name "RECENT" and is selected for use. After the "RECENT" channel table is switched on, another channel table can be selected with the command `CONFigure:CDPower[:BTS]:CTABle:SELect` on page 187.

Parameters:
<State> ON | OFF
*RST: OFF

Example: CONF:CDP:CTAB ON

Manual operation: See "Using Predefined Channel Tables" on page 90

11.5.6.3 Configuring Channel Tables

Some general settings and functions are available when configuring a predefined channel table.

CONFigure:CDPower[:BTS]:CTABle:COMMent....188
CONFigure:CDPower[:BTS]:CTABle:DATA....188
CONFigure:CDPower[:BTS]:CTABle:DATA....190
CONFigure:CDPower[:BTS]:CTABle:NAME....191

CONFigure:CDPower[:BTS]:CTABle:COMMent <Comment>

This command defines a comment for the selected channel table:

Prior to this command, the name of the channel table has to be defined with command CONFigure:CDPower[:BTS]:CTABle:NAME on page 191.

Parameters:
<Comment>

Example:
```
CONF:CDP:CTAB:NAME 'NEW_TAB'
```
Defines the channel table name.
```
CONF:CDP:CTAB:COMM 'Comment for table 1'
```
Defines a comment for the table.
```
CONF:CDP:CTAB:DATA
8,0,0,0,0,0,1,0.00,8,1,0,0,0,0,1,0.00,7,1,0,
256,8,0,1,0.00
```
Defines the table values.

Manual operation: See "Comment" on page 93

CONFigure:CDPower[:BTS]:CTABle:DATA <ChannelType>, <CodeClass>, <CodeNumber>, <Modulation>, <Reserved1>, <Reserved2>, <Status>, <CDPRelative>

This command defines a channel table.

The following description applies to cdma2000 BTS mode only. For MS mode, see CONFigure:CDPower[:BTS]:CTABle:DATA on page 190.

Before using this command, you must set the name of the channel table using the CONFigure:CDPower[:BTS]:CTABle:NAME command.

For a detailed description of the parameters refer to chapter 6.2.9.4, "BTS Channel Details", on page 93.

Parameters:

<ChannelType> Numeric channel type according to table 11-2

<CodeClass> 2..7

Code class depending on spreading factor; see table 4-1

<CodeNumber> 0…spreading factor-1

Channel number (without SF)

<Modulation> Modulation type including mapping
Modulation types QPSK/8-PSK/16-QAM have complex values

0
BPSK-I

1
BPSK-Q

2
QPSK

3
8-PSK

4
16-QAM

<Reserved1> Always 0 (reserved)

<Reserved2> Always 0 (reserved)

<Status> 0: inactive, 1: active
Can be used in a setting command to disable a channel temporarily

<CDPRelative> Power value in dB.

Example:

```
CONF:CDP:CTAB:NAME 'NEW_TAB'
```

Selects channel table for editing. If a channel table with this name does not exist, a new channel table is created.

```
CONF:CDP:CTAB:DATA
0,6,0,0,0,0,1,0.0,10,5,3,4,0,0,1,0.0
```

Defines a table with the following channels: PICH 0.64 and data channel with RC4/Walsh code 3.32.

Mode: BTS application only

Manual operation: See "Channel Type" on page 94
See "Channel Number (Ch. SF)" on page 94
See "Power" on page 95
See "Status" on page 95

CONFigure:CDPower[:BTS]:CTABle:DATA <ChannelType>, <CodeClass>, <CodeNumber>, <Mapping>, <Reserved1>, <Reserved2>, <Status>, <CDPRelative>

This command defines a channel table. The following description applies to MS mode only. For BTS mode, see `CONFigure:CDPower[:BTS]:CTABle:DATA` on page 188.

Before using this command, you must set the name of the channel table using the `CONFigure:CDPower[:BTS]:CTABle:NAME` command.

For a detailed description of the parameters refer to chapter 6.2.9.5, "MS Channel Details", on page 95.

Parameters:

<ChannelType> Numeric channel type according to table 11-4

<CodeClass> 2 to 4
Code class depending on spreading factor; see table 4-2

<CodeNumber> 0…spreading factor-1
Channel number (without SF)

<Mapping> **0**
I branch
1
Q branch

<Reserved1>, <Reserved2> Always 0 (reserved for future use)

<Status> 0: inactive, 1: active
Can be used in a setting command to disable a channel temporarily

<CDPRelative> Power value in dB.

Example:

```
"INST:SEL M2K"
'Activate cdma2000 MS mode
"CONF:CDP:CTAB:NAME 'NEW_TAB'"
'Select table to edit
"CONF:CDP:CTAB:DATA 0,4,0,0,65535,0,1,0,
1,4,0,0,43690,0,1,0,
2,2,2,1,65535,0,1,0"
```

Mode: MS mode only

Manual operation: See "Channel Type" on page 94
See "Channel Number (Ch. SF)" on page 94
See "Power" on page 95
See "Status" on page 95

CONFigure:CDPower[:BTS]:CTABle:NAME <Name>

This command creates a new channel table file or selects an existing channel table in order to copy or delete it.

Parameters:

<Name> string with a maximum of 8 characters
name of the channel table
*RST: RECENT

Example: `CONF:CDP:CTAB:NAME 'NEW_TAB'`

Manual operation: See "Creating a New Table" on page 92
See "Name" on page 93

11.5.7 Sweep Settings

[SENSe:]AVERage:COUNt....191
[SENSe:]SWEep:COUNt....191

[SENSe:]AVERage:COUNt <AverageCount>

This command defines the number of sweeps that the application uses to average traces.

In case of continuous sweeps, the application calculates the moving average over the average count.

In case of single sweep measurements, the application stops the measurement and calculates the average after the average count has been reached.

Parameters:

<AverageCount> If you set a average count of 0 or 1, the application performs one single sweep in single sweep mode.
In continuous sweep mode, if the average count is set to 0, a moving average over 10 sweeps is performed.
Range: 0 to 200000
*RST: 0

Usage: SCPI confirmed

Manual operation: See "Sweep/Average Count" on page 97

[SENSe:]SWEep:COUNt <SweepCount>

This command defines the number of sweeps that the application uses to average traces.

In case of continuous sweeps, the application calculates the moving average over the average count.

In case of single sweep measurements, the application stops the measurement and calculates the average after the average count has been reached.

Parameters:

<SweepCount> If you set a sweep count of 0 or 1, the R&S FSW performs one single sweep in single sweep mode.
In continuous sweep mode, if the sweep count is set to 0, a moving average over 10 sweeps is performed.

Range: 0 to 200000
*RST: 0

Example: `SWE:COUN 64`
Sets the number of sweeps to 64.
`INIT:CONT OFF`
Switches to single sweep mode.
`INIT;*WAI`
Starts a sweep and waits for its end.

Usage: SCPI confirmed

Manual operation: See "Sweep/Average Count" on page 97

11.5.8 Automatic Settings

MSRA operating mode

In MSRA operating mode, the following automatic commands are not available, as they require a new data acquisition. However, CDMA2000 applications cannot perform data acquisition in MSRA operating mode.

Useful commands for adjusting settings automatically described elsewhere:

- `DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:AUTO ONCE` on page 169

Remote commands exclusive to adjusting settings automatically:

[SENSe:]ADJust:ALL....192
[SENSe:]ADJust:CONFigure:DURation....193
[SENSe:]ADJust:CONFigure:DURation:MODE....193
[SENSe:]ADJust:CONFigure:HYSTeresis:LOWer....194
[SENSe:]ADJust:CONFigure:HYSTeresis:UPPer....194
[SENSe:]ADJust:LEVel....194

[SENSe:]ADJust:ALL

This command initiates a measurement to determine and set the ideal settings for the current task automatically (only once for the current measurement).

This includes:

- Reference level
- Scaling

Example: `ADJ:ALL`

Usage: Event

Manual operation: See "Adjusting all Determinable Settings Automatically (Auto All)" on page 99

[SENSe:]ADJust:CONFigure:DURation <Duration>

In order to determine the ideal reference level, the R&S FSW performs a measurement on the current input data. This command defines the length of the measurement if `[SENSe:]ADJust:CONFigure:DURation:MODE` is set to `MANual`.

Parameters:

<Duration> Numeric value in seconds

Range: 0.001 to 16000.0
*RST: 0.001
Default unit: s

Example: `ADJ:CONF:DUR:MODE MAN`
Selects manual definition of the measurement length.
`ADJ:CONF:LEV:DUR 5ms`
Length of the measurement is 5 ms.

Manual operation: See "Changing the Automatic Measurement Time (Meastime Manual)" on page 100

[SENSe:]ADJust:CONFigure:DURation:MODE <Mode>

In order to determine the ideal reference level, the R&S FSW performs a measurement on the current input data. This command selects the way the R&S FSW determines the length of the measurement .

Parameters:

<Mode>

AUTO
The R&S FSW determines the measurement length automatically according to the current input data.

MANual
The R&S FSW uses the measurement length defined by `[SENSe:]ADJust:CONFigure:DURation` on page 193.

*RST: AUTO

Manual operation: See "Resetting the Automatic Measurement Time (Meastime Auto)" on page 100
See "Changing the Automatic Measurement Time (Meastime Manual)" on page 100

[SENSe:]ADJust:CONFigure:HYSTeresis:LOWer <Threshold>

When the reference level is adjusted automatically using the `[SENSe:]ADJust:LEVel` on page 194 command, the internal attenuators and the preamplifier are also adjusted. In order to avoid frequent adaptation due to small changes in the input signal, you can define a hysteresis. This setting defines a lower threshold the signal must fall below (compared to the last measurement) before the reference level is adapted automatically.

Parameters:

<Threshold>
Range: 0 dB to 200 dB
*RST: +1 dB
Default unit: dB

Example: `SENS:ADJ:CONF:HYST:LOW 2`
For an input signal level of currently 20 dBm, the reference level will only be adjusted when the signal level falls below 18 dBm.

Manual operation: See "Lower Level Hysteresis" on page 100

[SENSe:]ADJust:CONFigure:HYSTeresis:UPPer <Threshold>

When the reference level is adjusted automatically using the `[SENSe:]ADJust:LEVel` on page 194 command, the internal attenuators and the preamplifier are also adjusted. In order to avoid frequent adaptation due to small changes in the input signal, you can define a hysteresis. This setting defines an upper threshold the signal must exceed (compared to the last measurement) before the reference level is adapted automatically.

Parameters:

<Threshold>
Range: 0 dB to 200 dB
*RST: +1 dB
Default unit: dB

Example: `SENS:ADJ:CONF:HYST:UPP 2`

Example: For an input signal level of currently 20 dBm, the reference level will only be adjusted when the signal level rises above 22 dBm.

Manual operation: See "Upper Level Hysteresis" on page 100

[SENSe:]ADJust:LEVel

This command initiates a single (internal) measurement that evaluates and sets the ideal reference level for the current input data and measurement settings. This ensures that the settings of the RF attenuation and the reference level are optimally adjusted to the signal level without overloading the R&S FSW or limiting the dynamic range by an S/N ratio that is too small.

Example: `ADJ:LEV`

Usage: Event

Manual operation: See "Reference Level" on page 76
See "Setting the Reference Level Automatically (Auto Level)" on page 76

11.5.9 Evaluation Range

The evaluation range defines which data is evaluated in the result display.

[SENSe:]CDPower:CODE....195
[SENSe:]CDPower:MAPPing....195
[SENSe:]CDPower:SET....195
[SENSe:]CDPower:SLOT....196

[SENSe:]CDPower:CODE <CodeNo>

This command selects the code number.

For further details refer to "Code Number" on page 109.

Parameters:
<CodeNo> <numeric value>
Range: 0 to base spreading factor - 1
Increment: 1
*RST: 0

Example: `CDP:CODE 8`
Selects the eighth channel.

Manual operation: See "Code Number" on page 109

[SENSe:]CDPower:MAPPing <SignalComponent>

This command switches between the I and Q branch of the signal.

Parameters:
<SignalComponent> I | Q
*RST: Q

Example: `CDP:MAPP Q`

Manual operation: See "Mapping" on page 97
See "Branch (MS application only)" on page 110

[SENSe:]CDPower:SET <SetNo>

This command selects a specific set for further analysis. The number of sets has to be defined with the `[SENSe:]CDPower:SET:COUNt` command before using this command.

Parameters:

<SetNo> Range: 0 to SET COUNT -1
Increment: 1
*RST: 0

Example: `CDP:SET:COUN 10`
Selects the 11th set for further analysis (counting starts with 0).

Manual operation: See "Set to Analyze" on page 88

[SENSe:]CDPower:SLOT <numeric value>

This command selects the slot (PCG) to be analyzed.

Parameters:

<numeric value> Range: 0 to 63
Increment: 1
*RST: 0

Example: `CDP:SLOT 7`
Selects slot number 7 for analysis.

Manual operation: See "Power Control Group" on page 110

11.5.10 Code Domain Analysis Settings

Some evaluations provide further settings for the results. The commands for Code Domain Analysis are described here.

[SENSe:]CDPower:NORMalize....196
[SENSe:]CDPower:ORDer....197
[SENSe:]CDPower:PDISplay....197
[SENSe:]CDPower:PPReference....197
[SENSe:]CDPower:PREFerence....198
[SENSe:]CDPower:SFACtor....198
[SENSe:]CDPower:TPMeas....198

[SENSe:]CDPower:NORMalize <State>

If enabled, the I/Q offset is eliminated from the measured signal. This is useful to deduct a DC offset to the baseband caused by the DUT, thus improving the EVM. Note, however, that for EVM measurements according to standard, compensation must be disabled.

Parameters:

<State> ON | OFF
*RST: OFF

Example: `SENS:CDP:NORM ON`
Activates the elimination of the I/Q offset.

Manual operation: See "Compensate IQ Offset" on page 108

[SENSe:]CDPower:ORDer <SortOrder>

This command sets the channel sorting for the Code Domain Power and Code Domain Error Power result displays.

Parameters:

<SortOrder> HADamard | BITReverse

*RST: HADamard

For further details refer to chapter 4.3, "Code Display and Sort Order", on page 38.

Example:

```
CDP:ORD HAD
```

Sets Hadamard order.

```
TRAC? TRACE2
```

Reads out the results in Hadamard order.

```
CDP:ORD BITR
```

Sets BitReverse order.

```
TRAC? TRACE2
```

Reads out the results in BitReverse order.

Manual operation: See "Code Display Order" on page 109

[SENSe:]CDPower:PDISplay <Mode>

This command defines how the pilot channel power is displayed in the Result Summary. In relative mode, the reference power is the total power.

Parameters:

<Mode> ABS | REL

*RST: ABS

Example:

```
CDP:PDIS REL
```

Pilot channel power is displayed in relation to the total power.

Manual operation: See "Code Power Display" on page 108

[SENSe:]CDPower:PPReference <Mode>

This command is only available for "Code Domain Power" evaluation in MS mode.

This command defines how the pilot channel power is displayed in the absolute summary. In relative mode, the reference power is the total power.

Parameters:

<Mode> ABS | REL

*RST: ABS

Example:

```
CDP:PPR REL
```

Pilot channel power is displayed in relation to the total power.

Manual operation: See "Pilot Power Display (MS application only)" on page 108

[SENSe:]CDPower:PREFerence <Power>

This command specifies the reference power for the relative power result displays (e.g. Code Domain Power, Power vs PCG).

Parameters:

<Power> PICH | TOTal

PICH
The reference power is the power of the pilot channel.
Which pilot channel is used as reference depends on the antenna diversity (for details see `[SENSe:]CDPower:ANTenna` on page 146 command).

TOTal
The reference power is the total power of the signal.

*RST: PICH
For further information refer to "Power Reference" on page 108.

Example: `CDP:PREF TOT`
Sets total power as reference power.

Manual operation: See "Power Reference" on page 108

[SENSe:]CDPower:SFACtor <SpreadingFactor>

This command defines the base spreading factor. If the base spreading factor of 64 is used for channels with a spreading factor of 128 (code class 7), an alias power is displayed in the Code Domain Power and Code Domain Error Power diagrams.

For more information see chapter 4.3, "Code Display and Sort Order", on page 38.

Parameters:

<SpreadingFactor> 64 | 128

*RST: 64

Example: `CDP:SFAC 128`
Selects base spreading factor 128.

Manual operation: See "Base Spreading Factor" on page 108

[SENSe:]CDPower:TPMeas <State>

This command activates or deactivates the timing and phase offset evaluation of the channels to the pilot.

The results are queried using the `TRAC:DATA? CTAB` command or the `CALC:MARK:FUNC:CDP[:BTS]:RES?` command.

Parameters:

<State> ON | OFF

*RST: OFF

Example:
```
CDP:TPM ON
```
Activates timing and phase offset.
```
CDP:SLOT 2
```
Selects slot 2.
```
CDP:CODE 11
```
Selects code number 11.
```
CALC:MARK:FUNC:CDP:RES? TOFF
```
Reads out timing offset of the code with number 11 in slot 2.
```
CALC:MARK:FUNC:CDP:RES? POFF
```
Reads out the phase offset of the code with number 11 in slot 2.

Manual operation: See "Timing and phase offset calculation " on page 108

11.6 Configuring RF Measurements

RF measurements are performed in the Spectrum application, with some predefined settings as described in chapter 3.2, "RF Measurements", on page 28.

For details on configuring these RF measurements in a remote environment, see the Remote Commands chapter of the R&S FSW User Manual.

The cdma2000 RF measurements must be activated in a CDMA2000 application, see chapter 11.3, "Activating the Measurement Channel", on page 138.

The individiual measurements are activated using the `CONFigure:CDPower[:BTS]:MEASurement` on page 142 command (see chapter 11.4, "Selecting a Measurement", on page 142).

- Special RF Configuration Commands.....199
- Analysis for RF Measurements.....200

11.6.1 Special RF Configuration Commands

In addition to the common RF measurement configuration commands described for the base unit, the following special commands are available in cdma2000 applications:

CONFigure:CDPower[:BTS]:BCLass|BANDclass.....199

CONFigure:CDPower[:BTS]:BCLass|BANDclass <Bandclass>

This command selects the bandclass for the measurement. The bandclass defines the frequency band used for ACLR and SEM measurements. It also determines the corresponding limits and ACLR channel settings according to the CDMA2000 standard.

Parameters:

<Bandclass> For an overview of available bandclasses and the corresponding parameter values see chapter A.3, "Reference: Supported Bandclasses", on page 259.

*RST: 0

Example: `CONF:CDP:BCL 1`
Selects band class 1, 1900 MHz

Manual operation: See "Bandclass" on page 104

11.6.2 Analysis for RF Measurements

General result analysis settings concerning the trace, markers, lines etc. for RF measurements are identical to the analysis functions in the Spectrum application except for some special marker functions and spectrograms, which are not available in CDMA2000 applications.

For details see the "General Measurement Analysis and Display" chapter in the R&S FSW User Manual.

11.7 Configuring the Result Display

The following commands are required to configure the screen display in a remote environment. The tasks for manual operation are described in chapter 3, "Measurements and Result Displays", on page 15.

- General Window Commands....200
- Working with Windows in the Display....201
- Zooming into the Display....207

11.7.1 General Window Commands

The following commands are required to configure general window layout, independant of the application.

Note that the suffix <n> always refers to the window *in the currently selected measurement channel* (see `INSTrument[:SELect]` on page 142).

DISPlay:FORMat....200
DISPlay[:WINDow<n>]:SIZE....201

DISPlay:FORMat <Format>

This command determines which tab is displayed.

Parameters:

<Format>

SPLit
Displays the MultiView tab with an overview of all active channels

SINGle
Displays the measurement channel that was previously focused.

*RST: SPL

Example: `DISP:FORM SING`

DISPlay[:WINDow<n>]:SIZE <Size>

This command maximizes the size of the selected result display window *temporarily*. To change the size of several windows on the screen permanently, use the `LAY:SPL` command (see `LAYout:SPLitter` on page 204).

Parameters:

<Size>

LARGe
Maximizes the selected window to full screen.
Other windows are still active in the background.

SMALl
Reduces the size of the selected window to its original size.
If more than one measurement window was displayed originally, these are visible again.

*RST: SMALl

Example: `DISP:WIND2:LARG`

11.7.2 Working with Windows in the Display

The following commands are required to change the evaluation type and rearrange the screen layout for a measurement channel as you do using the SmartGrid in manual operation. Since the available evaluation types depend on the selected application, some parameters for the following commands also depend on the selected measurement channel.

Note that the suffix <n> always refers to the window *in the currently selected measurement channel* (see `INSTrument[:SELect]` on page 142).

LAYout:ADD[:WINDow]?....201
LAYout:CATalog[:WINDow]?....203
LAYout:IDENtify[:WINDow]?....203
LAYout:REMove[:WINDow]....204
LAYout:REPLace[:WINDow]....204
LAYout:SPLitter....204
LAYout:WINDow<n>:ADD?....206
LAYout:WINDow<n>:IDENtify?....206
LAYout:WINDow<n>:REMove....206
LAYout:WINDow<n>:REPLace....207

LAYout:ADD[:WINDow]? <WindowName>,<Direction>,<WindowType>

This command adds a window to the display.

This command is always used as a query so that you immediately obtain the name of the new window as a result.

To replace an existing window, use the `LAYout:REPLace[:WINDow]` command.

Parameters:

<WindowName> String containing the name of the existing window the new window is inserted next to.
By default, the name of a window is the same as its index. To determine the name and index of all active windows, use the `LAYout:CATalog[:WINDow]?` query.

<Direction> LEFT | RIGHt | ABOVe | BELow
Direction the new window is added relative to the existing window.

<WindowType> text value
Type of result display (evaluation method) you want to add.
See the table below for available parameter values.

Return values:

<NewWindowName> When adding a new window, the command returns its name (by default the same as its number) as a result.

Example:
```
LAY:ADD? '1',LEFT,MTAB
```
Result:
```
'2'
```
Adds a new window named '2' with a marker table to the left of window 1.

Example:
```
LAY:ADD? '1',BEL,'XPOW:CDP:ABSolute'
```
Adds a Code Domain Power display below window 1.

Usage: Query only

Manual operation:
See "Bitstream" on page 18
See "Channel Table" on page 19
See "Code Domain Power / Code Domain Error Power" on page 21
See "Composite Constellation" on page 22
See "Composite EVM" on page 23
See "Peak Code Domain Error" on page 24
See "Power vs PCG" on page 25
See "Power vs Symbol" on page 25
See "Result Summary" on page 26
See "Symbol Constellation" on page 26
See "Symbol EVM" on page 27
See "Diagram" on page 33
See "Result Summary" on page 34
See "Marker Table" on page 34
See "Marker Peak List" on page 34

Table 11-6: <WindowType> parameter values for CDMA2000 application

Parameter value	Window type
BITStream	Bitstream
CCONst	Composite Constellation
CDEPower	Code Domain Error Power

Parameter value	Window type
CDPower	Code Domain Power
CEVM	Composite EVM
CTABle	Channel Table
LEValuation	List evaluation (SEM, Power vs Time)
MTABle	Marker table
PCDerror	Peak Code Domain Error
PPCG	Power vs PCG
PSYMbol	Power vs Symbol
RSUMmary	Result Summary
SCONst	Symbol Constellation
SEVM	Symbol EVM

LAYout:CATalog[:WINDow]?

This command queries the name and index of all active windows from top left to bottom right. The result is a comma-separated list of values for each window, with the syntax:

<WindowName_1>,<WindowIndex_1>..<WindowName_n>,<WindowIndex_n>

Return values:

<WindowName> string
Name of the window.
In the default state, the name of the window is its index.

<WindowIndex> **numeric value**
Index of the window.

Example: `LAY:CAT?`
Result:
`'2',2,'1',1`
Two windows are displayed, named '2' (at the top or left), and '1' (at the bottom or right).

Usage: Query only

LAYout:IDENtify[:WINDow]? <WindowName>

This command queries the **index** of a particular display window.

Note: to query the **name** of a particular window, use the `LAYout:WINDow<n>:IDENtify?` query.

Query parameters:

<WindowName> String containing the name of a window.

Return values:
<WindowIndex> Index number of the window.

Usage: Query only

LAYout:REMove[:WINDow] <WindowName>

This command removes a window from the display.

Parameters:
<WindowName> String containing the name of the window.
In the default state, the name of the window is its index.

Usage: Event

LAYout:REPLace[:WINDow] <WindowName>,<WindowType>

This command replaces the window type (for example from "Diagram" to "Result Summary") of an already existing window while keeping its position, index and window name.

To add a new window, use the `LAYout:ADD[:WINDow]?` command.

Parameters:
<WindowName> String containing the name of the existing window.
By default, the name of a window is the same as its index. To determine the name and index of all active windows, use the `LAYout:CATalog[:WINDow]?` query.

<WindowType> Type of result display you want to use in the existing window.
See `LAYout:ADD[:WINDow]?` on page 201 for a list of available window types.

Example: `LAY:REPL:WIND '1',MTAB`
Replaces the result display in window 1 with a marker table.

LAYout:SPLitter <Index1>,<Index2>,<Position>

This command changes the position of a splitter and thus controls the size of the windows on each side of the splitter.

As opposed to the `DISPlay[:WINDow<n>]:SIZE` on page 201 command, the `LAYout:SPLitter` changes the size of all windows to either side of the splitter permanently, it does not just maximize a single window temporarily.

Note that windows must have a certain minimum size. If the position you define conflicts with the minimum size of any of the affected windows, the command will not work, but does not return an error.

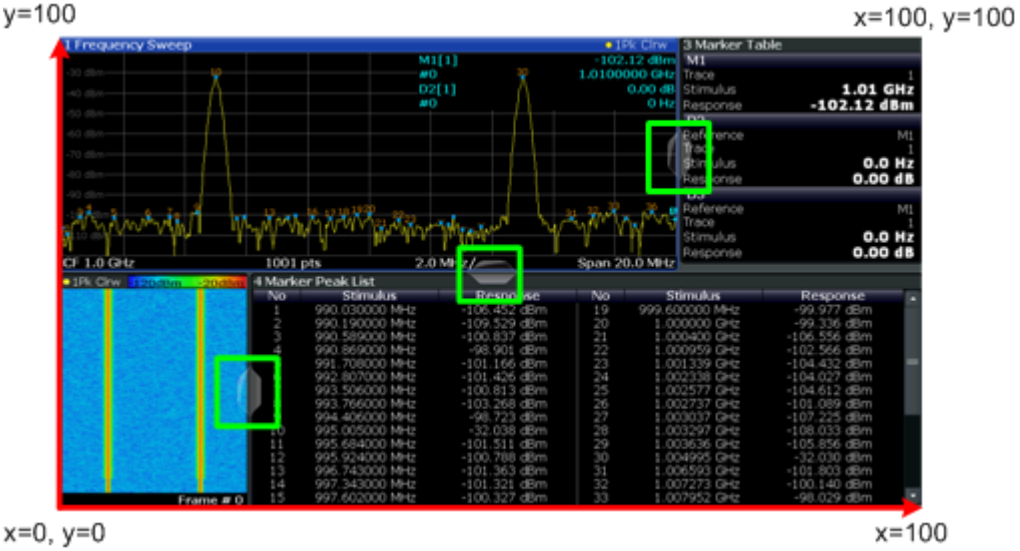


Fig. 11-1: SmartGrid coordinates for remote control of the splitters

Parameters:

<Index1> The index of one window the splitter controls.

<Index2> The index of a window on the other side of the splitter.

<Position> New vertical or horizontal position of the splitter as a fraction of the screen area (without channel and status bar and softkey menu). The point of origin (x = 0, y = 0) is in the lower left corner of the screen. The end point (x = 100, y = 100) is in the upper right corner of the screen. (See figure 11-1.)
The direction in which the splitter is moved depends on the screen layout. If the windows are positioned horizontally, the splitter also moves horizontally. If the windows are positioned vertically, the splitter also moves vertically.

Range: 0 to 100

Example: `LAY:SPL 1,3,50`
Moves the splitter between window 1 ('Frequency Sweep') and 3 ('Marker Table') to the center (50%) of the screen, i.e. in the figure above, to the left.

Example: `LAY:SPL 1,4,70`
Moves the splitter between window 1 ('Frequency Sweep') and 3 ('Marker Peak List') towards the top (70%) of the screen.
The following commands have the exact same effect, as any combination of windows above and below the splitter moves the splitter vertically.

```
LAY:SPL 3,2,70
LAY:SPL 4,1,70
LAY:SPL 2,1,70
```

LAYout:WINDow<n>:ADD? <Direction>,<WindowType>

This command adds a measurement window to the display. Note that with this command, the suffix <n> determines the existing window next to which the new window is added, as opposed to `LAYout:ADD[:WINDow]?`, for which the existing window is defined by a parameter.

To replace an existing window, use the `LAYout:WINDow<n>:REPLace` command.

This command is always used as a query so that you immediately obtain the name of the new window as a result.

Parameters:

<Direction> LEFT | RIGHt | ABOVe | BELow

<WindowType> Type of measurement window you want to add.
See `LAYout:ADD[:WINDow]?` on page 201 for a list of available window types.

Return values:

<NewWindowName> When adding a new window, the command returns its name (by default the same as its number) as a result.

Example:

```
LAY:WIND1:ADD? LEFT,MTAB
Result:
'2'
```

Adds a new window named '2' with a marker table to the left of window 1.

Usage: Query only

LAYout:WINDow<n>:IDENtify?

This command queries the **name** of a particular display window (indicated by the <n> suffix).

Note: to query the **index** of a particular window, use the `LAYout:IDENtify[:WINDow]?` command.

Return values:

<WindowName> String containing the name of a window.
In the default state, the name of the window is its index.

Usage: Query only

LAYout:WINDow<n>:REMove

This command removes the window specified by the suffix <n> from the display.

The result of this command is identical to the `LAYout:REMove[:WINDow]` command.

Usage: Event

LAYout:WINDow<n>:REPLace <WindowType>

This command changes the window type of an existing window (specified by the suffix <n>).

The result of this command is identical to the `LAYout:REPLace[:WINDow]` command.

To add a new window, use the `LAYout:WINDow<n>:ADD?` command.

Parameters:

<WindowType> Type of measurement window you want to replace another one with.
See `LAYout:ADD[:WINDow]?` on page 201 for a list of available window types.

11.7.3 Zooming into the Display

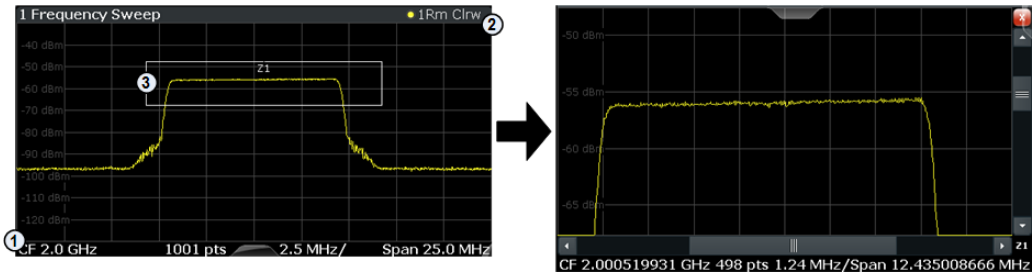
11.7.3.1 Using the Single Zoom

DISPlay[:WINDow<n>]:ZOOM:AREA.....207
DISPlay[:WINDow<n>]:ZOOM:STATe.....208

DISPlay[:WINDow<n>]:ZOOM:AREA <x1>,<y1>,<x2>,<y2>

This command defines the zoom area.

To define a zoom area, you first have to turn the zoom on.



1 = origin of coordinate system (x1 = 0, y1 = 0)
2 = end point of system (x2 = 100, y2= 100)
3 = zoom area (e.g. x1 = 60, y1 = 30, x2 = 80, y2 = 75)

Parameters:

<x1>,<y1>, <x2>,<y2> Diagram coordinates in % of the complete diagram that define the zoom area.
The lower left corner is the origin of coordinate system. The upper right corner is the end point of the system.

Range: 0 to 100
Default unit: PCT

Manual operation: See "Single Zoom" on page 101

DISPlay[:WINDow<n>]:ZOOM:STATe <State>

This command turns the zoom on and off.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `DISP:ZOOM ON`
Activates the zoom mode.

Manual operation: See "Single Zoom" on page 101
See "Restore Original Display" on page 101
See "Deactivating Zoom (Selection mode)" on page 101

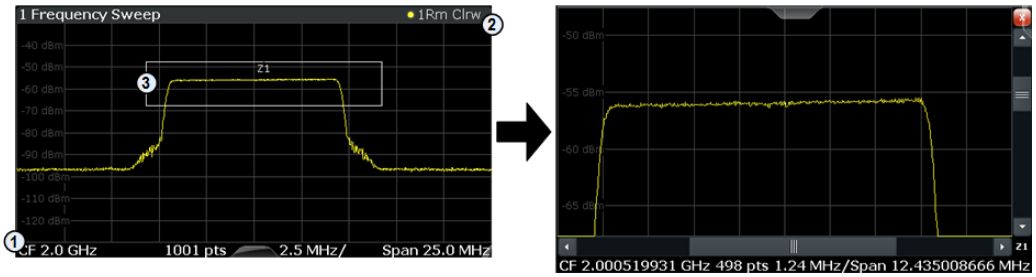
11.7.3.2 Using the Multiple Zoom

DISPlay[:WINDow<n>]:ZOOM:MULTiple<zoom>:AREA.....208
DISPlay[:WINDow<n>]:ZOOM:MULTiple<zoom>:STATe.....209

DISPlay[:WINDow<n>]:ZOOM:MULTiple<zoom>:AREA <x1>,<y1>,<x2>,<y2>

This command defines the zoom area for a multiple zoom.

To define a zoom area, you first have to turn the zoom on.



1 = origin of coordinate system (x1 = 0, y1 = 0)
2 = end point of system (x2 = 100, y2= 100)
3 = zoom area (e.g. x1 = 60, y1 = 30, x2 = 80, y2 = 75)

Suffix:

<zoom> 1...4
Selects the zoom window.

Parameters:

<x1>,<y1>, <x2>,<y2> Diagram coordinates in % of the complete diagram that define the zoom area.
The lower left corner is the origin of coordinate system. The upper right corner is the end point of the system.

Range: 0 to 100
Default unit: PCT

Manual operation: See "Multiple Zoom" on page 101

DISPlay[:WINDow<n>]:ZOOM:MULTiple<zoom>:STATe <State>

This command turns the mutliple zoom on and off.

Suffix:

<zoom> 1...4
Selects the zoom window.
If you turn off one of the zoom windows, all subsequent zoom windows move up one position.

Parameters:

<State> ON | OFF

*RST: OFF

Manual operation: See "Multiple Zoom" on page 101
See "Restore Original Display" on page 101
See "Deactivating Zoom (Selection mode)" on page 101

11.8 Starting a Measurement

The measurement is started immediately when a cdma2000 application is activated, however, you can stop and start a new measurement any time.

ABORt....209
INITiate:CONMeas....210
INITiate:CONTinuous....211
INITiate[:IMMediate]....211
INITiate:SEQuencer:ABORt....212
INITiate:SEQuencer:IMMediate....212
INITiate:SEQuencer:MODE....212
INITiate:SEQuencer:REFResh[:ALL]....213
SYSTem:SEQuencer....214

ABORt

This command aborts a current measurement and resets the trigger system.

To prevent overlapping execution of the subsequent command before the measurement has been aborted successfully, use the `*OPC?` or `*WAI` command after `ABOR` and before the next command.

For details see the "Remote Basics" chapter in the R&S FSW User Manual.

To abort a sequence of measurements by the Sequencer, use the `INITiate:SEQuencer:ABORt` on page 212 command.

Note on blocked remote control programs:

If a sequential command cannot be completed, for example because a triggered sweep never receives a trigger, the remote control program will never finish and the remote channel (GPIB, LAN or other interface) to the R&S FSW is blocked for further commands. In this case, you must interrupt processing on the remote channel first in order to abort the measurement.

To do so, send a "Device Clear" command from the control instrument to the R&S FSW on a parallel channel to clear all currently active remote channels. Depending on the used interface and protocol, send the following commands:

- **Visa**: `viClear()`
- **GPIB**: `ibclr()`
- **RSIB**: `RSDLLibclr()`

Now you can send the `ABORt` command on the remote channel performing the measurement.

Example: `ABOR;:INIT:IMM`
Aborts the current measurement and immediately starts a new one.

Example:
```
ABOR;*WAI
INIT:IMM
```
Aborts the current measurement and starts a new one once abortion has been completed.

Usage: SCPI confirmed

INITiate:CONMeas

This command restarts a (single) measurement that has been stopped (using `INIT:CONT OFF`) or finished in single sweep mode.

The measurement is restarted at the beginning, not where the previous measurement was stopped.

As opposed to `INITiate[:IMMediate]`, this command does not reset traces in maxhold, minhold or average mode. Therefore it can be used to continue measurements using maxhold or averaging functions.

Example: (for Spectrum application:)
`INIT:CONT OFF`
Switches to single sweep mode.
`DISP:WIND:TRAC:MODE AVER`
Switches on trace averaging.
`SWE:COUN 20`
Setting the sweep counter to 20 sweeps.
`INIT;*WAI`
Starts the measurement and waits for the end of the 20 sweeps.
`INIT:CONM;*WAI`
Continues the measurement (next 20 sweeps) and waits for the end.
Result: Averaging is performed over 40 sweeps.

Manual operation: See "Continue Single Sweep" on page 98

INITiate:CONTinuous <State>

This command controls the sweep mode.

Note that in single sweep mode, you can synchronize to the end of the measurement with *OPC, *OPC? or *WAI. In continuous sweep mode, synchronization to the end of the measurement is not possible. Thus, it is not recommended that you use continuous sweep mode in remote control, as results like trace data or markers are only valid after a single sweep end synchronization.

For details on synchronization see the "Remote Basics" chapter in the R&S FSW User Manual.

If the sweep mode is changed for a measurement channel while the Sequencer is active (see `INITiate:SEQuencer:IMMediate` on page 212) the mode is only considered the next time the measurement in that channel is activated by the Sequencer.

Parameters:

<State> ON | OFF | 0 | 1

ON | 1
Continuous sweep

OFF | 0
Single sweep

*RST: 1

Example: `INIT:CONT OFF`
Switches the sweep mode to single sweep.
`INIT:CONT ON`
Switches the sweep mode to continuous sweep.

Manual operation: See "Continuous Sweep/RUN CONT" on page 98

INITiate[:IMMediate]

This command starts a (single) new measurement.

With sweep count or average count > 0, this means a restart of the corresponding number of measurements. With trace mode MAXHold, MINHold and AVERage, the previous results are reset on restarting the measurement.

You can synchronize to the end of the measurement with *OPC, *OPC? or *WAI.

For details on synchronization see the "Remote Basics" chapter in the R&S FSW User Manual.

Example: (For Spectrum application:)
`INIT:CONT OFF`
Switches to single sweep mode.
`DISP:WIND:TRAC:MODE AVER`
Switches on trace averaging.
`SWE:COUN 20`
Sets the sweep counter to 20 sweeps.
`INIT;*WAI`
Starts the measurement and waits for the end of the 20 sweeps.

Manual operation: See "Single Sweep/ RUN SINGLE" on page 98

INITiate:SEQuencer:ABORt

This command stops the currently active sequence of measurements. The Sequencer itself is not deactivated, so you can start a new sequence immediately using `INITiate:SEQuencer:IMMediate` on page 212.

To deactivate the Sequencer use `SYSTem:SEQuencer` on page 214.

Usage: Event

INITiate:SEQuencer:IMMediate

This command starts a new sequence of measurements by the Sequencer. Its effect is similar to the `INITiate[:IMMediate]` command used for a single measurement.

Before this command can be executed, the Sequencer must be activated (see `SYSTem:SEQuencer` on page 214).

Example:
`SYST:SEQ ON`
Activates the Sequencer.
`INIT:SEQ:MODE SING`
Sets single sequence mode so each active measurement will be performed once.
`INIT:SEQ:IMM`
Starts the sequential measurements.

Usage: Event

INITiate:SEQuencer:MODE <Mode>

This command selects the way the R&S FSW application performs measurements sequentially.

Before this command can be executed, the Sequencer must be activated (see `SYSTem:SEQuencer` on page 214).

A detailed programming example is provided in the "Operating Modes" chapter in the R&S FSW User Manual.

Note: In order to synchronize to the end of a sequential measurement using *OPC, *OPC? or *WAI you must use `SINGle` Sequence mode.

For details on synchronization see the "Remote Basics" chapter in the R&S FSW User Manual.

Parameters:

<Mode>

SINGle
Each measurement is performed once (regardless of the channel's sweep mode), considering each channels' sweep count, until all measurements in all active channels have been performed.

CONTinuous
The measurements in each active channel are performed one after the other, repeatedly (regardless of the channel's sweep mode), in the same order, until the Sequencer is stopped.

CDEFined
First, a single sequence is performed. Then, only those channels in continuous sweep mode (`INIT:CONT ON`) are repeated.

*RST: CONTinuous

Example:

`SYST:SEQ ON`
Activates the Sequencer.
`INIT:SEQ:MODE SING`
Sets single sequence mode so each active measurement will be performed once.
`INIT:SEQ:IMM`
Starts the sequential measurements.

INITiate:SEQuencer:REFResh[:ALL]

This function is only available if the Sequencer is deactivated (`SYSTem:SEQuencer SYST:SEQ:OFF`) and only in MSRA mode.

The data in the capture buffer is re-evaluated by all active MSRA applications.

Example:

`SYST:SEQ:OFF`
Deactivates the scheduler
`INIT:CONT OFF`
Switches to single sweep mode.
`INIT;*WAI`
Starts a new data measurement and waits for the end of the sweep.
`INIT:SEQ:REFR`
Refreshes the display for all MSRA channels.

Usage: Event

SYSTem:SEQuencer <State>

This command turns the Sequencer on and off. The Sequencer must be active before any other Sequencer commands (`INIT:SEQ...`) are executed, otherwise an error will occur.

A detailed programming example is provided in the "Operating Modes" chapter in the R&S FSW User Manual.

Parameters:

<State> ON | OFF | 0 | 1

ON | 1
The Sequencer is activated and a sequential measurement is started immediately.

OFF | 0
The Sequencer is deactivated. Any running sequential measurements are stopped. Further Sequencer commands (`INIT:SEQ...`) are not available.

*RST: 0

Example:

```
SYST:SEQ ON
```
Activates the Sequencer.
```
INIT:SEQ:MODE SING
```
Sets single Sequencer mode so each active measurement will be performed once.
```
INIT:SEQ:IMM
```
Starts the sequential measurements.
```
SYST:SEQ OFF
```

11.9 Retrieving Results

The following commands retrieve the results from a cdma2000 measurement in a remote environment.

When the channel type is required as a parameter by a remote command or provided as a result for a remote query, abbreviations or assignments to a numeric value are used as described in chapter 11.5.6, "Channel Detection", on page 183.

Specific commands:

- Retrieving Calculated CDA Results....215
- Retrieving CDA Trace Results....217
- Measurement Results for TRACe<n>[:DATA]? TRACE<n>....219
- Exporting Trace Results....232
- Retrieving RF Results....233

11.9.1 Retrieving Calculated CDA Results

The following commands describe how to retrieve the calculated results from the CDA measurements.

CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult?....215
CALCulate<n>:MARKer<m>:Y?....217

CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult? <Measurement>

This command queries individual values of the measured and calculated results of the CDMA2000 code domain power measurement.

Query parameters:

<Measurement>

ACTive
Number of active channels

CDPabsolute
Channel power absolute in dBm

CDPRelative
Channel power relative in dB (relative to total or PICH power, refer to `CDP:PREF` command)

CERRor
Chip rate error in ppm

CHANnel
Channel number

DMType
Domain type

EVMRms
Error vector magnitude RMS in %

EVMPeak
Error vector mag. peak in %

FERPpm
Frequency error in ppm

FERRor
Frequency error in Hz

IQIMbalance
IQ imbalance in %

IQOFfset
IQ offset in %

MACCuracy
Composite EVM in %

PCDerror
Peak code domain error in dB

POFFset
Phase offset in rad

PPICh
Pilot power in dBm

PTOTal
Total power in dBm

RHO
RHO

SFACtor
Spreading factor of channel

SLOT
PCG number

SRATe
Symbol rate in ksps

TFRame I

Trigger to frame

TOFFset
Timing offset in s

Example: `CALC:MARK:FUNC:CDP:RES? PTOT`

Usage: Query only

Manual operation: See "Code Domain Power / Code Domain Error Power" on page 21
See "Composite Constellation" on page 22
See "Composite EVM" on page 23
See "Peak Code Domain Error" on page 24
See "Power vs Symbol" on page 25
See "Result Summary" on page 26
See "Symbol Constellation" on page 26
See "Symbol EVM" on page 27

CALCulate<n>:MARKer<m>:Y?

This command queries the position of a marker on the y-axis.

If necessary, the command activates the marker first.

To get a valid result, you have to perform a complete measurement with synchronization to the end of the measurement before reading out the result. This is only possible for single sweeps. See also `INITiate:CONTinuous` on page 211.

Return values:
<Result> Result at the marker position.

Example:
```
INIT:CONT OFF
```
Switches to single measurement mode.
```
CALC:MARK2 ON
```
Switches marker 2.
```
INIT;*WAI
```
Starts a measurement and waits for the end.
```
CALC:MARK2:Y?
```
Outputs the measured value of marker 2.

Usage: Query only

Manual operation: See "CCDF" on page 32
See "Marker Table" on page 34
See "Marker Peak List" on page 34

11.9.2 Retrieving CDA Trace Results

The following commands describe how to retrieve the trace data from the CDA measurements. Note that for these measurements, only 1 trace per window can be configured.

FORMat[:DATA] <Format>

This command selects the data format that is used for transmission of trace data from the R&S FSW to the controlling computer.

Note that the command has no effect for data that you send to the R&S FSW. The R&S FSW automatically recognizes the data it receives, regardless of the format.

Parameters:

<Format>

ASCii
ASCii format, separated by commas.
This format is almost always suitable, regardless of the actual data format. However, the data is not as compact as other formats may be.

REAL,32
32-bit IEEE 754 floating-point numbers in the "definite length block format".
In the Spectrum application, the format setting `REAL` is used for the binary transmission of trace data.
For I/Q data, 8 bytes per sample are returned for this format setting.

*RST: ASCII

Example: `FORM REAL,32`

Usage: SCPI confirmed

TRACe<n>[:DATA]? <ResultType>

This command reads trace data from the R&S FSW.

For details on reading trace data for other than code domain measurements refer to the `TRACe:DATA` command in the base unit description.

Query parameters:

<ResultType>

TRACE1 | TRACE2 | TRACE3 | TRACE4
Reads out the trace data of the corresponding trace in the specified measurement window. The results of the trace data query depend on the evaluation method in the specified window, which is selected by the `LAY:ADD:WIND` command. The individual results are described in chapter 11.9.3, "Measurement Results for TRACe<n>[:DATA]? TRACE<n>", on page 219.

CTABle
For the Channel Table result display, reads out the maximum values of the timing/phase offset between each assigned channel and the pilot channel (see `[SENSe:]CDPower:TPMeas` command).
To query the detailed channel information use the `TRAC:DATA? TRACE1` command for a window with Channel Table evaluation.

LIST
Queries the results of the peak list evaluation for Spectrum Emission Mask measurements.
For each peak the following entries are given:
<peak frequency>, <absolute level of the peak>, <distance to the limit line>
For details refer to the `TRACe:DATA` command in the base unit description.

Usage: Query only
SCPI confirmed

11.9.3 Measurement Results for TRACe<n>[:DATA]? TRACE<n>

The results of the trace data query (TRACe<n>[:DATA]? TRACE<n>) depend on the evaluation method in the specified window, which is selected by the `LAY:ADD:WIND` command.

For each evaluation method the returned values for the trace data query are described in the following sections.

For details on the graphical results of these evaluation methods, see chapter 3, "Measurements and Result Displays", on page 15.

- Bitstream....220
- Channel Table....220
- Code Domain Error Power....224
- Code Domain Power....224
- Composite Constellation....228
- Composite EVM (RMS)....228
- EVM vs Chip....229
- Frequency Error vs PCG....229
- Mag Error vs Chip....229
- Power vs PCG....229
- Peak Code Domain Error....229

- Phase Discontinuity vs PCG....229
- Phase Error vs Chip....230
- Power vs Symbol....230
- Result Summary....230
- Symbol Constellation....231
- Symbol EVM....231
- Symbol Magnitude Error....232
- Symbol Phase Error....232

11.9.3.1 Bitstream

When the trace data for this evaluation is queried, the bit stream of one PCG (i.e. one value per bit for each symbol) is transferred. Each symbol contains two consecutive bits in the case of a QPSK modulated PCG and 4 consecutive bits in the case of a 16QAM modulated PCG. One value is transferred per bit (range 0, 1). The number of symbols is not constant and may vary for each sweep. Individual symbols in the bit stream may be invalid depending on the channel type and the bit rate (symbols without power). The assigned invalid bits are marked by one of the digits "6", "7" or "9".

11.9.3.2 Channel Table

Two different commands are available to retrieve the channel table results:

- `TRAC:DATA? TRACEx` commands return detailed trace information for each channel
- `TRAC:DATA? CTABle` provides the maximum values of the timing/phase offset between each assigned channel and the pilot channel

Results for TRACEx Parameters

The command returns 8 values for each channel in the following order:

<channel type>, <code class>, <code number>, <radio configuration>, <absolute level>, <relative level>, <timing offset>, <phase offset>

Value	Description	Range/Unit
<channel type>	channel type (see table 11-2 and table 11-4)	{0..13} (BTS) {0..9} (MS)
<code class>	code class of the channel (see chapter 4.2, "Channels, Codes and Symbols", on page 36)	{2...7} (BTS) {1..6} (MS)
<code number>	code number within the channel	{0..127} (BTS) {0..63}(MS)
<radio config> (BTS only)	radio configuration (see chapter 4.6, "Radio Configuration", on page 41)	
<mapping> (MS only)	channel mapping	0 = I branch 1 = Q branch

Value	Description	Range/Unit
<absolute level>	absolute power level of the channel	{-∞...∞} dBm
<relative level>	relative power level of the channel, referred to either Total or Pilot power	{-∞...∞} dB
<timing offset>	referred to the pilot channel	s
<phase offset>	referred to the pilot channel	9 for: • CDP:TPM OFF • > 50 active channels found • inactive channel rad

In **BTS measurements**, the channels are sorted according to these rules:

1. All detected special channels
2. Data channels, in ascending order by code class and within the code class in ascending order by code number
3. Unassigned codes, with the code class of the base spreading factor

In **MS measurements**, the channels are sorted according to these rules:

1. All active channels
2. All inactive or quasi-active channels, in ascending code number order, I branch first, followed by Q branch
   Data channels, in ascending order by code class and within the code class in ascending order by code number
3. Unassigned codes, with the code class of the base spreading factor

Measurement Example: Retrieving the BTS Channel Table Values

The example shows the results of the query for 5 channels with the following configuration:

Chan. type	Ch.no./SF	Code class	Power
PICH	0.64	6	-7.0 dB
PCH	1.64	6	-7.3 dB
CHAN	8.32	5	-8.0 dB
CHAN	24.128	7	-9.0 dB (alias with 24.64)
SYNC	32.64	6	-13.3 dB

```
INST:SEL BC2K
//Activate cdma2000 BTS, default is CDP relative in window 1 and
```

```
//Result Summary in window 2
INIT:CONT OFF
//Select single sweep
INIT:CONT OFF
//Select single sweep
LAY:REPL:WIND '1',CTAB
//Replace CDP by Channel Table evaluation in window 1
INIT;*WAI
//Start measurement with synchronization
TRAC? TRACE1
//Read out channel table
//Result:
//0 , 6, 0, 0,       0.0, -7.0, 9, 9,
//1 , 6, 32, 0,     -6.3, -13.3, 9, 9,
//2 , 6, 1, 0,      -0.3, -7.3, 9, 9,
//10, 5, 8, 3,      -1.0, -8.0, 9, 9,
//10, 7, 24, 3,     -2.0, -9.0, 9, 9,
//11, 6, 2, 3,      -47.6, -54.6, 9, 9,
//....
//11, 6, 63, 3,     -47.7, -54.7, 9, 9
```

Measurement Example: Retrieving the MS Channel Table Values

The example shows the results of the query for 2 channels with the following configuration:

Chan. type	Ch.no./SF	Code class	Mapping	Power
PICH	0.32	5	I	-7.0 dB
CCCH	2.8	3	Q	-10:0 dB

```
INIT:CONT OFF
//Select single sweep
INIT:CONT OFF
//Select single sweep
LAY:REPL:WIND '1',CTAB
//Replace CDP by Channel Table evaluation in window 1
INIT;*WAI
//Start measurement with synchronization
TRAC? TRACE1
//Read out channel table
//Result:
//0 , 5, 0, 0,       0.0, -7.0, 9, 9,
//2 , 2, 2, 1,      -3.0, -10.0, 9, 9,
//9 , 5, 0, 1,      -46.3, -53.3, 9, 9,
//9 , 5, 1, 0,      -48.0, -55.0, 9, 9,
//9 , 5, 1, 1,      -43.2, -50.2, 9, 9,
//9 , 5, 2, 0,      -42.0, -49.0, 9, 9,
//9 , 5, 3, 0,      -47.6, -54.6, 9, 9,
```

```
//....
//9 , 5, 31, 1,     -47.7, -54.7, 9, 9
```

Results for CTABle Parameter

The command returns 12 values for each channel in the following order:

<max. time offset in s>, <code number for max. time>, <code class for max. time>, <max. phase offset in rad>, <code number for max. phase>, <code class for max. phase>, <reserved 1>, …, <reserved 6>

Value	Description	Range/ Unit
<time offset>	maximum time offset	s
<code number>	code number of the channel with maximum time offset	{0..127} (BTS) {0..63}(MS)
<code class>	code class of the channel with maximum time offset	{2...7} (BTS) {1..6} (MS)
<phase offset>	maximum phase offset	rad
<code number>	code number of the channel with maximum phase offset	{0..127} (BTS) {0..63}(MS)
<code class>	code class of the channel with maximum phase offset	{2...7} (BTS) {1..6} (MS)
<reserved 1...6>	reserved for future use	0

Measurement example for TRAC:DATA? CTAB

```
INIT:CONT OFF
//Select single sweep
INIT:CONT OFF
//Select single sweep
LAY:REPL:WIND '1',CTAB
//Replace CDP by Channel Table evaluation in window 1
INIT;*WAI
//Start measurement with synchronization
TRAC? CTAB
//Read out maximum timing and phase offsets
//Result: 1.20E-009,2,2,-3.01E-003,15,4,0,0,0,0,0,0
//where:
//1.20E-009,2,2,
//Max. time offset with code number and
//code class of associated channel
//-3.01E-003,15,4,
//Max. phase offset with code number
//and code class of associated channel
//0,0,0,0,0,0
//6 reserved values
```

11.9.3.3 Code Domain Error Power

The command returns four values for each channel:

<code class>, <code number>, <error power>, <power ID>

The Hadamard or BitReverse order is important for sorting the channels, but not for the number of values.

With Hadamard, the individual codes are output in ascending order.

With BitReverse, codes which belong to a particular channel are adjacent to each other.

Since an error power is output for Code Domain Error Power, consolidation of the power values is not appropriate. The number of codes that are output therefore generally corresponds to the base spreading factor.

Value	Description	Range/ Unit
<code class>	code class of the channel (see chapter 4.2, "Channels, Codes and Symbols", on page 36)	{2...7} (BTS) {1..6} (MS)
<code number>	code number within the channel	{0..127} (BTS) {0..63}(MS)
<signal level>	error power	{-∞...∞}dB
<power ID>	type of power detection: 0 - inactive channel 1 - power of own antenna 2 - alias power of own antenna 3 - alias power of other antenna 4 - alias power of own and other antenna	

To avoid alias power, set the base spreading factor correctly.

For details on these parameters see `TRACe<n>[:DATA]?` on page 218.

11.9.3.4 Code Domain Power

The command returns four values for each channel:

<code class>, <code number>, <signal level>, <power ID>

The number of displayed values depends on the spreading factor.

In Hadamard order, the different codes are output in ascending order together with their code power. The number of output codes corresponds to the base spreading factor.

In BitReverse order, codes belonging to a channel are next to one another and are therefore output in the class of the channel together with the consolidated channel power. The maximum number of output codes or channels cannot be higher than the base spreading factor, but decreases with every concentrated channel.

Value	Description	Range/ Unit
<code class>	code class of the channel (see chapter 4.2, "Channels, Codes and Symbols", on page 36)	{2...7} (BTS) {1..6} (MS)
<code number>	code number within the channel	{0..127} (BTS) {0..63}(MS)
<signal level>	absolute or relative power, depending on the setting (See `[SENSe:]CDPower:PREFerence`) Hadamard order: power values for each code BitReverse order: power values for combined channels	{-∞...∞}dB or dBm
<power ID>	type of power detection: 0 - inactive channel 1 - power of own antenna 2 - alias power of own antenna 3 - alias power of other antenna 4 - alias power of own and other antenna	

To avoid alias power, set the base spreading factor correctly.

For details on these parameters see `TRACe<n>[:DATA]?` on page 218.

Measurement Example: Retrieving the Code Domain Power in the BTS Application

The example shows the results of the query for 5 channels with the following configuration:

Chan. type	Ch.no./SF	Code class	Power
PICH	0.64	6	-7.0 dB
PCH	1.64	6	-7.3 dB
CHAN	8.32	5	-8.0 dB
CHAN	24.128	7	-9.0 dB (alias with 24.64)
SYNC	32.64	6	-13.3 dB

```
INST:SEL BC2K
//Activate cdma2000 BTS, default is CDP relative in window 1 and
//Result Summary in window 2
INIT:CONT OFF
//Select single sweep
CDP:ORD HAD
//Set order to Hadamard
INIT;*WAI
//Start measurement with synchronization
TRAC? TRACE1
```

```
//Read out CDP relative/Hadamard;
//Channel 8.32 is distributed to 8.64 and 40.64, in each case with half power:
//-8dB - 3dB = -11.0 dB
//Result:
//6, 0, -7.0,1,      6, 1, -7.3,1,
//6, 2,-54.6,0,      6, 3,-55.3,0,
//         ....      6, 7,-58.2,0,
//6, 8,-11.0,1,      6, 9,-53.4,0,
//         ....      6,24, -9.0,2,
//         ....      6,32,-13.3,1,
//         ....      6,40,-11.0,1,
//         ....      6,63,-54.7,0
CDP:ORD BITR
//Set order to BitReverse
TRAC? TRACE1
//Read out CDP relative/BitReverse
//Channel 8.32 can now be directly read out with its total power.
//The sort order changes in accordance with BitReverse.
//Result:
//6, 0, -7.0,1,      6,32,-13.3,1,
//6,16,-56.3,0,      6,48,-52.8,0,
//5, 8, -8.0,1,      6,24, -9.0,2,
//         ....      6, 1, -7.3,1,
//         ....      6,63,-54.7,0


INST:SEL BC2K
//Activate cdma2000 BTS, default is CDP relative in window 1 and
//Result Summary in window 2
INIT:CONT OFF
//Select single sweep
CDP:ORD HAD
//Set order to Hadamard
INIT;*WAI
//Start measurement with synchronization
TRAC? TRACE1
//Read out CDP relative/Hadamard
//Channel 8.32 is distributed to 8.64 and 40.64, in each case with half power:
// -8dB - 3dB = -11.0dB
//Result:
//6, 0, -7.0,1, 6, 1, -7.3,1,
//6, 2,-54.6,0, 6, 3,-55.3,0,
//.... 6, 7,-58.2,0,
//6, 8,-11.0,1, 6, 9,-53.4,0,
//.... 6,24, -9.0,2,
//.... 6,32,-13.3,1,
//.... 6,40,-11.0,1,
//.... 6,63,-54.7,0
CDP:ORD BITR
//Set order to BitReverse
```

```
TRAC? TRACE1
//Read out CDP relative/BitReverse
//Channel 8.32 can now be directly read out with its total power.
//The sort order changes in accordance with BitReverse.
//Result:
//6, 0, -7.0,1, 6,32,-13.3,1,
//6,16,-56.3,0, 6,48,-52.8,0,
//5, 8, -8.0,1, 6,24, -9.0,2,
//.... 6, 1, -7.3,1,
//.... 6,63,-54.7,0
```

Measurement Example: Retrieving the Code Domain Power (MS mode)

The example shows the results of the query for 2 channels with the following configuration:

Chan. type	Ch.no./SF	Code class	Mapping	Power
PICH	0.32	5	I	-7.0 dB
CCCH	2.8	3	Q	-10:0 dB

```
INST:SEL MC2K
//Activate cdma2000 MS, default is CDP relative in window 1 and
//Result Summary in window 2
//Mapping set to I
INIT:CONT OFF
//Select single sweep
CDDP:MAPP Q
//Select Q branch
CDP:ORD HAD
//Set order to Hadamard
INIT;*WAI
//Start measurement with synchronization
TRAC? TRACE1
//Read out CDP relative/Hadamard/Q
//Result:
//5, 0,-52.3,3,      5, 1,-53.3,0,
//5, 2,-16.1,1,      5, 3,-55.3,0,
//         ....      5, 9,-58.2,0,
//5,10,-16.0,1,      5,11,-53.4,0,
//         ....      5,17,-49.0,0,
//5,18,-15.8,1,      5,19,-53.3,0,
//         ....      5,25,-51.0,0,
//5,26,-16.1,1,      5,27,-54.7,0
         ....      5,31,-51.7,0
//Code 0 is quasi-inactive since PICH is set to I
//Channel 2.8 is distributed between the active codes
//2.32, 10.32, 18.32 and 26.32
//each with one quarter of the power: -10dB - 6dB = -16.0dB
CDP:ORD BITR
```

```
//Set order to BitReverse
TRAC? TRACE1
//Read out CDP relative/BitReverse/Q
//Sorting is changed according to BitReverse.
//Result:
//5, 0,-52.3,3,      5,16,-57.3,0
//5, 8,-56.3.0,      ....
//3, 2,-10.0,1,      5, 6,-55.3,0,
         ....      5,31,-51.7,0
//Code 0 is quasi-inactive since PICH is set to I
//Channel 2.8 can now be read out directly with its total power
CDP:OVER ON
//Activate Overview mode
//CDP relative on window 1 I branch
//CDP relative on window 2 Q branch
TRAC? TRACE1
//Read out CDP relative of I branch
//Result:
//5, 0, -7.0,1,      5,16,-52.3,0
//5, 8,-57.1.0,      ....
//5, 2,-49.0,3,      5,18,-49.0,3,
//5,10,-49.0,3,      5,26,-49.0,3
//5, 6,-55.3,0,      5, 6,-53.4,0,
         ....      5,31,-51.7,0
//PICH is active
//Codes of channel 2.8 are quasi-inactive
TRAC? TRACE2
//Read out CDP relative of Q branch
//Result:
//5, 0,-52.3,3,      6,16,-57.3,0
//5, 8,-56.3.0,      ....
//3, 2,-10.0,1,      6, 3,-55.3,0,
         ....      5,31,-51.7,0
```

11.9.3.5 Composite Constellation

When the trace data for this evaluation is queried, the real and the imaginary branches of each chip are transferred:

<Re $chip_0$>, <Im $chip_0$>, <Re $chip_1$>, <Im $chip_1$>, ..., <Re $chip_n$>, <Im $chip_n$>

The number of value pairs corresponds to the chip number of 1536 chips in a power control group.

11.9.3.6 Composite EVM (RMS)

When the trace data for this evaluation is queried, one pair of PCG and level value is transferred for each PCG:

<PCG number>, <level value in %>

The number of value pairs corresponds to the number of captured PCGs.

11.9.3.7 EVM vs Chip

When the trace data for this evaluation is queried, a list of vector error values of all chips at the selected PCG is returned (=2560 values). The values are calculated as the square root of the square difference between the received signal and the reference signal for each chip, normalized to the square root of the average power at the selected PCG.

11.9.3.8 Frequency Error vs PCG

When the trace data for this evaluation is queried, one pair of PCG and error value is transferred for each PCG:

<PCG number>, <value in Hz>

11.9.3.9 Mag Error vs Chip

When the trace data for this evaluation is queried, a list of magnitude error values of all chips at the selected PCG is returned (=2560 values). The values are calculated as the magnitude difference between the received signal and the reference signal for each chip in %, and are normalized to the square root of the average power at the selected PCG.

11.9.3.10 Power vs PCG

When the trace data for this evaluation is queried, one pair of PCG and level values is transferred for each PCG:

<PCG number>, <level value in dB>

The number of value pairs corresponds to the number of captured PCGs.

11.9.3.11 Peak Code Domain Error

The command returns 2 values for each PCG in the following order:

<PCG number>, <level value in dB>

The number of value pairs corresponds to the number of captured PCGs.

11.9.3.12 Phase Discontinuity vs PCG

When the trace data for this evaluation is queried, one pair of PCG and value is transferred for each PCG:

<PCG number>, <value in deg>

11.9.3.13 Phase Error vs Chip

When the trace data for this evaluation is queried, a list of phase error values of all chips in the selected PCG is returned (=2560 values). The values are calculated as the phase difference between the received signal and the reference signal for each chip in degrees, and are normalized to the square root of the average power at the selected PCG.

11.9.3.14 Power vs Symbol

When the trace data for this evaluation is queried. One power value per symbol is returned.

The number of values depends on the number of symbols and therefore the spreading factor. With transmit diversity activated, the number of values is reduced to half.

For details see "Number of bits per symbol" on page 38.

11.9.3.15 Result Summary

When the trace data for this evaluation is queried, the results of the result summary are output in the following order:

<PCG>, <PTOTal>, <PPICh>, <RHO>, <MACCuracy>, <PCDerror>, <ACTive>, <FERRor>, <FERPpm>, <TFRame>, <CERRor>, <IQOFfset>, <IQIMbalance>, <SRATe>, <CHANnel>, <SFACtor>, <TOFFset>, <POFFset>, <CDPRelative>, <CDPabsolute>, <EVMRms>, <EVMPeak>

Value	Description	Range / Unit
<PCG>	Number of the PCG	
<PTOTal>	Total power	{-∞...∞} dBm
<PPICh>	Pilot power	{-∞...∞} dBm
<RHO>	RHO	{0...1}
<MACCuracy>	Composite EVM	%
<PCDerror>	Peak Code Domain Error	dB
<ACTive>	Number of active channels	
<FERRor>	Frequency error	Hz
<FERPpm>	Frequency error	ppm
<TFRame>	Trigger to Frame	Returns a '9' if the trigger is set to Free Run
<CERRor>	Chip rate error	ppm
<IQOFfset>	IQ offset	%
<IQIMbalance>	IQ imbalance	%

Value	Description	Range / Unit
<SRATe>	Symbol rate	ksps
<CHANnel>	Channel number	
<SFACtor>	Spreading factor of the channel	
<TOFFset>	Timing offset	returns a '9' if the timing/phase offset measurement is switched off or the number of active channel exceeds 50 unit: s
<POFFset>	Phase offset	returns a '9' if the timing/phase offset measurement is switched off or the number of active channel exceeds 50 unit: rad
<CDPRelative>	Relative (to total or pilot power) channel power	{-∞...∞} dBm
<CDPabsolute>	Absolute channel power	{-∞...∞} dB
<EVMRms>	Error vector magnitude (RMS)	%
<EVMPeak>	Error vector magnitude peak	%

Read out the modulation type with the command: `CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult?` on page 215

11.9.3.16 Symbol Constellation

When the trace data for this evaluation is queried, the real and the imaginary branches of each symbol are transferred:

<Re_0>, <Im_0>, <Re_1>, <Im_1>, ..., <Re_n>, <Im_n>

The number of values depends on the number of symbols and therefore the spreading factor. With transmit diversity activated, the number of values is reduced to half.

For details see "Number of bits per symbol" on page 38.

11.9.3.17 Symbol EVM

When the trace data for this evaluation is queried. one EVM value per symbol is returned.

The number of values depends on the number of symbols and therefore the spreading factor. With transmit diversity activated, the number of values is reduced to half.

For details see "Number of bits per symbol" on page 38.

11.9.3.18 Symbol Magnitude Error

When the trace data for this evaluation is queried, the magnitude error in % of each symbol at the selected PCG is transferred. The number of the symbols depends on the spreading factor of the selected channel:

NOFSymbols=10*2$^{(8\text{-CodeClass})}$

11.9.3.19 Symbol Phase Error

When the trace data for this evaluation is queried, the phase error in degrees of each symbol at the selected PCG is transferred. The number of the symbols depends on the spreading factor of the selected channel:

NOFSymbols=10*2$^{(8\text{-CodeClass})}$

11.9.4 Exporting Trace Results

Trace results can be exported to a file.

For more commands concerning data and results storage see the R&S FSW User Manual.

MMEMory:STORe<n>:TRACe....232
FORMat:DEXPort:DSEParator....232

MMEMory:STORe<n>:TRACe <Trace>, <FileName>

This command exports trace data from the specified window to an ASCII file.

Trace export is only available for RF measurements.

For details on the file format see "Reference: ASCII File Export Format" in the R&S FSW User Manual.

Parameters:

<Trace> Number of the trace to be stored

<FileName> String containing the path and name of the target file.

Example: `MMEM:STOR1:TRAC 3,'TEST.ASC'`
Stores trace 3 from window 1 in the file `TEST.ASC`.

Usage: SCPI confirmed

FORMat:DEXPort:DSEParator <Separator>

This command selects the decimal separator for data exported in ASCII format.

Parameters:

<Separator>

COMMa
Uses a comma as decimal separator, e.g. *4,05*.

POINt
Uses a point as decimal separator, e.g. *4.05*.

*RST: *RST has no effect on the decimal separator. Default is POINt.

Example: `FORM:DEXP:DSEP POIN`
Sets the decimal point as separator.

11.9.5 Retrieving RF Results

The following commands retrieve the results of the cdma2000 RF measurements.

Useful commands for retrieving results described elsewhere:

- `CALCulate<n>:MARKer<m>:Y?` on page 217

Remote commands exclusive to retrieving RF results:

CALCulate:LIMit<k>:FAIL....233
CALCulate:MARKer:FUNCtion:POWer:RESult?....234
CALCulate:STATistics:RESult<t>?....236

CALCulate:LIMit<k>:FAIL

This command queries the result of a limit check.

Note that for SEM measurements, the limit line suffix <k> is irrelevant, as only one specific SEM limit line is checked for the currently relevant power class.

To get a valid result, you have to perform a complete measurement with synchronization to the end of the measurement before reading out the result. This is only possible for single sweeps. See also `INITiate:CONTinuous` on page 211.

Return values:

<Result>

0
PASS

1
FAIL

Example: `INIT;*WAI`
Starts a new sweep and waits for its end.
`CALC:LIM3:FAIL?`
Queries the result of the check for limit line 3.

Usage: SCPI confirmed

Manual operation: See "Spectrum Emission Mask" on page 30

CALCulate:MARKer:FUNCtion:POWer:RESult? <Measurement>

This command queries the results of power measurements.

To get a valid result, you have to perform a complete measurement with synchronization to the end of the measurement before reading out the result. This is only possible for single sweeps. See also `INITiate:CONTinuous` on page 211.

Query parameters:

<Measurement>

ACPower | MCACpower
ACLR measurements (also known as adjacent channel power or multi-carrier adjacent channel measurements).
Returns the power for every active transmission and adjacent channel. The order is:
• power of the transmission channels
• power of adjacent channel (lower,upper)
• power of alternate channels (lower,upper)
MSR ACLR results:
For MSR ACLR measurements, the order of the returned results is slightly different:
• power of the transmission channels
• total power of the transmission channels for each subblock
• power of adjacent channels (lower, upper)
• power of alternate channels (lower, upper)
• power of gap channels (lower1, upper1, lower2, upper2)
The unit of the return values depends on the scaling of the y-axis:
• logarithmic scaling returns the power in the current unit
• linear scaling returns the power in W

CN
Carrier-to-noise measurements.
Returns the C/N ratio in dB.

CN0
Carrier-to-noise measurements.
Returns the C/N ratio referenced to a 1 Hz bandwidth in dBm/Hz.

CPOWer
Channel power measurements.
Returns the channel power. The unit of the return values depends on the scaling of the y-axis:
• logarithmic scaling returns the power in the current unit
• linear scaling returns the power in W
For SEM measurements, the return value is the channel power of the reference range.

PPOWer
Peak power measurements.
Returns the peak power. The unit of the return values depends on the scaling of the y-axis:
• logarithmic scaling returns the power in the current unit
• linear scaling returns the power in W
For SEM measurements, the return value is the peak power of the reference range.

OBANdwidth | OBWidth
Occupied bandwidth.
Returns the occupied bandwidth in Hz.

Usage: Query only

Manual operation: See "Power" on page 28
See "Channel Power ACLR" on page 29
See "Spectrum Emission Mask" on page 30
See "Occupied Bandwidth" on page 31
See "CCDF" on page 32

CALCulate:STATistics:RESult<t>? <ResultType>

This command queries the results of a CCDF or ADP measurement for a specific trace.

Parameters:

<ResultType>

MEAN
Average (=RMS) power in dBm measured during the measurement time.

PEAK
Peak power in dBm measured during the measurement time.

CFACtor
Determined crest factor (= ratio of peak power to average power) in dB.

ALL
Results of all three measurements mentioned before, separated by commas: <mean power>,<peak power>,<crest factor>

Example: `CALC:STAT:RES2? ALL`
Reads out the three measurement results of trace 2. Example of answer string: 5.56,19.25,13.69 i.e. mean power: 5.56 dBm, peak power 19.25 dBm, crest factor 13.69 dB

Usage: Query only

Manual operation: See "CCDF" on page 32

11.10 General Analysis

The following commands configure general result analysis settings concerning the trace and markers for CDA measurements.

For RF measurements, see the Remote Commands - Analysis chapter in the R&S FSW User Manual.

- Traces....237
- Markers....238

11.10.1 Traces

The trace settings determine how the measured data is analyzed and displayed on the screen. In cdma2000 applications, only one trace per window can be configured for Code Domain Analysis.

DISPlay[:WINDow<n>]:TRACe<t>:MODE....237
DISPlay[:WINDow<n>]:TRACe<t>[:STATe]....238

DISPlay[:WINDow<n>]:TRACe<t>:MODE <Mode>

This command selects the trace mode.

In case of max hold, min hold or average trace mode, you can set the number of single measurements with `[SENSe:]SWEep:COUNt`. Note that synchronization to the end of the measurement is possible only in single sweep mode.

Parameters:

<Mode>

WRITe
Overwrite mode: the trace is overwritten by each sweep. This is the default setting.

AVERage
The average is formed over several sweeps. The "Sweep/Average Count" determines the number of averaging procedures.

MAXHold
The maximum value is determined over several sweeps and displayed. The R&S FSW saves the sweep result in the trace memory only if the new value is greater than the previous one.

MINHold
The minimum value is determined from several measurements and displayed. The R&S FSW saves the sweep result in the trace memory only if the new value is lower than the previous one.

VIEW
The current contents of the trace memory are frozen and displayed.

BLANk
Hides the selected trace.

*RST: Trace 1: WRITe, Trace 2-6: BLANk

Example:

```
INIT:CONT OFF
```
Switching to single sweep mode.
```
SWE:COUN 16
```
Sets the number of measurements to 16.
```
DISP:TRAC3:MODE WRIT
```
Selects clear/write mode for trace 3.
```
INIT;*WAI
```
Starts the measurement and waits for the end of the measurement.

Manual operation: See "Trace Mode" on page 111

DISPlay[:WINDow<n>]:TRACe<t>[:STATe] <State>

This command turns a trace on and off.

The measurement continues in the background.

Parameters:

<State> ON | OFF | 0 | 1

*RST: 1 for TRACe1, 0 for TRACe 2 to 6

Example: `DISP:TRAC3 ON`

Usage: SCPI confirmed

11.10.2 Markers

Markers help you analyze your measurement results by determining particular values in the diagram. In cdma2000 applications, only 4 markers per window can be configured for Code Domain Analysis.

- Individual Marker Settings....238
- General Marker Settings....241
- Marker Search and Positioning Settings....241

11.10.2.1 Individual Marker Settings

CALCulate<n>:MARKer<m>:AOFF....238
CALCulate<n>:MARKer<m>[:STATe]....238
CALCulate<n>:MARKer<m>:X....239
CALCulate<n>:DELTamarker:AOFF....239
CALCulate<n>:DELTamarker<m>[:STATe]....239
CALCulate<n>:DELTamarker<m>:X....240
CALCulate<n>:DELTamarker<m>:X:RELative?....240
CALCulate<n>:DELTamarker<m>:Y?....240

CALCulate<n>:MARKer<m>:AOFF

This command turns all markers off.

Example: `CALC:MARK:AOFF`
Switches off all markers.

Usage: Event

Manual operation: See "All Markers Off" on page 115

CALCulate<n>:MARKer<m>[:STATe] <State>

This command turns markers on and off. If the corresponding marker number is currently active as a deltamarker, it is turned into a normal marker.

Parameters:
<State> ON | OFF
*RST: OFF

Example: `CALC:MARK3 ON`
Switches on marker 3.

Manual operation: See "Marker State" on page 114
See "Marker Type" on page 114

CALCulate<n>:MARKer<m>:X <Position>

This command moves a marker to a particular coordinate on the x-axis.

If necessary, the command activates the marker.

If the marker has been used as a delta marker, the command turns it into a normal marker.

Parameters:
<Position> Numeric value that defines the marker position on the x-axis.
The unit is either Hz (frequency domain) or s (time domain) or dB (statistics).
Range: The range depends on the current x-axis range.

Example: `CALC:MARK2:X 1.7MHz`
Positions marker 2 to frequency 1.7 MHz.

Manual operation: See "Marker Table" on page 34
See "Marker Peak List" on page 34
See "X-value" on page 114

CALCulate<n>:DELTamarker:AOFF

This command turns all delta markers off.

Example: `CALC:DELT:AOFF`
Turns all delta markers off.

Usage: Event

CALCulate<n>:DELTamarker<m>[:STATe] <State>

This command turns delta markers on and off.

If necessary, the command activates the delta marker first.

No suffix at DELTamarker turns on delta marker 1.

Parameters:
<State> ON | OFF
*RST: OFF

Example: `CALC:DELT2 ON`
Turns on delta marker 2.

Manual operation: See "Marker State" on page 114
See "Marker Type" on page 114

CALCulate<n>:DELTamarker<m>:X <Position>

This command moves a delta marker to a particular coordinate on the x-axis.

If necessary, the command activates the delta marker and positions a reference marker to the peak power.

Example: `CALC:DELT:X?`
Outputs the (absolute) x-value of delta marker 1.

Manual operation: See "X-value" on page 114

CALCulate<n>:DELTamarker<m>:X:RELative?

This command queries the relative position of a delta marker on the x-axis.

If necessary, the command activates the delta marker first.

Return values:
<Position> Position of the delta marker in relation to the reference marker or the fixed reference.

Example: `CALC:DELT3:X:REL?`
Outputs the frequency of delta marker 3 relative to marker 1 or relative to the reference position.

Usage: Query only

CALCulate<n>:DELTamarker<m>:Y?

This command queries the relative position of a delta marker on the y-axis.

If necessary, the command activates the delta marker first.

To get a valid result, you have to perform a complete measurement with synchronization to the end of the measurement before reading out the result. This is only possible for single sweeps. See also `INITiate:CONTinuous` on page 211.

The unit depends on the application of the command.

Return values:
<Position> Position of the delta marker in relation to the reference marker or the fixed reference.

Example: `INIT:CONT OFF`
Switches to single sweep mode.
`INIT;*WAI`
Starts a sweep and waits for its end.
`CALC:DELT2 ON`
Switches on delta marker 2.
`CALC:DELT2:Y?`
Outputs measurement value of delta marker 2.

Usage: Query only

11.10.2.2 General Marker Settings

DISPlay:MTABle....241

DISPlay:MTABle <DisplayMode>

This command turns the marker table on and off.

Parameters:
<DisplayMode>
ON
Turns the marker table on.
OFF
Turns the marker table off.
AUTO
Turns the marker table on if 3 or more markers are active.
*RST: AUTO

Example: `DISP:MTAB ON`
Activates the marker table.

Manual operation: See "Marker Table Display" on page 115

11.10.2.3 Marker Search and Positioning Settings

CALCulate<n>:MARKer<m>:FUNCtion:PICH....242
CALCulate<n>:MARKer<m>:FUNCtion:TDPIch....242
CALCulate<n>:MARKer<m>:MAXimum:LEFT....242
CALCulate<n>:MARKer<m>:MAXimum:NEXT....242
CALCulate<n>:MARKer<m>:MAXimum:RIGHt....242
CALCulate<n>:MARKer<m>:MAXimum[:PEAK]....243
CALCulate<n>:MARKer<m>:MINimum:LEFT....243
CALCulate<n>:MARKer<m>:MINimum:NEXT....243
CALCulate<n>:MARKer<m>:MINimum:RIGHt....243
CALCulate<n>:MARKer<m>:MINimum[:PEAK]....243
CALCulate<n>:DELTamarker<m>:MAXimum:LEFT....244
CALCulate<n>:DELTamarker<m>:MAXimum:NEXT....244
CALCulate<n>:DELTamarker<m>:MAXimum:RIGHt....244
CALCulate<n>:DELTamarker<m>:MAXimum[:PEAK]....244
CALCulate<n>:DELTamarker<m>:MINimum:LEFT....244

CALCulate<n>:DELTamarker<m>:MINimum:NEXT....244
CALCulate<n>:DELTamarker<m>:MINimum:RIGHt....245
CALCulate<n>:DELTamarker<m>:MINimum[:PEAK]....245

CALCulate<n>:MARKer<m>:FUNCtion:PICH

This command sets the marker to channel 0.64.

Example: `CALC:MARK:FUNC:PICH`
Activates marker and positions it at pilot 0.64.
`CALC:MARK:Y?`
Queries value of the relative Code Domain Power of the pilot channel.

Mode: BTS application only

Manual operation: See "Marker To PICH" on page 118

CALCulate<n>:MARKer<m>:FUNCtion:TDPIch

This command sets the marker to channel 16.128.

Example: `CALC:MARK:FUNC:TDPI`
Activates marker and positions it at TDPICH 16.128.
`CALC:MARK:Y?`
Queries value of the relative Code Domain Power of the transmit diversity pilot channel.

Mode: BTS application only

Manual operation: See "Marker To TDPICH" on page 118

CALCulate<n>:MARKer<m>:MAXimum:LEFT

This command moves a marker to the next lower peak.

The search includes only measurement values to the left of the current marker position.

Usage: Event

Manual operation: See "Search Mode for Next Peak" on page 116

CALCulate<n>:MARKer<m>:MAXimum:NEXT

This command moves a marker to the next lower peak.

Usage: Event

Manual operation: See "Search Mode for Next Peak" on page 116
See "Search Next Peak" on page 117

CALCulate<n>:MARKer<m>:MAXimum:RIGHt

This command moves a marker to the next lower peak.

The search includes only measurement values to the right of the current marker position.

Usage: Event

Manual operation: See "Search Mode for Next Peak" on page 116

CALCulate<n>:MARKer<m>:MAXimum[:PEAK]

This command moves a marker to the highest level.

If the marker is not yet active, the command first activates the marker.

Usage: Event

Manual operation: See "Peak Search" on page 118

CALCulate<n>:MARKer<m>:MINimum:LEFT

This command moves a marker to the next minimum value.

The search includes only measurement values to the right of the current marker position.

Usage: Event

Manual operation: See "Search Mode for Next Peak" on page 116

CALCulate<n>:MARKer<m>:MINimum:NEXT

This command moves a marker to the next minimum value.

Usage: Event

Manual operation: See "Search Mode for Next Peak" on page 116
See "Search Next Minimum" on page 118

CALCulate<n>:MARKer<m>:MINimum:RIGHt

This command moves a marker to the next minimum value.

The search includes only measurement values to the right of the current marker position.

Usage: Event

Manual operation: See "Search Mode for Next Peak" on page 116

CALCulate<n>:MARKer<m>:MINimum[:PEAK]

This command moves a marker to the minimum level.

If the marker is not yet active, the command first activates the marker.

Usage: Event

Manual operation: See "Search Minimum" on page 118

CALCulate<n>:DELTamarker<m>:MAXimum:LEFT

This command moves a delta marker to the next higher value.

The search includes only measurement values to the left of the current marker position.

Usage: Event

Manual operation: See "Search Mode for Next Peak" on page 116

CALCulate<n>:DELTamarker<m>:MAXimum:NEXT

This command moves a marker to the next higher value.

Usage: Event

Manual operation: See "Search Mode for Next Peak" on page 116
See "Search Next Peak" on page 117

CALCulate<n>:DELTamarker<m>:MAXimum:RIGHt

This command moves a delta marker to the next higher value.

The search includes only measurement values to the right of the current marker position.

Usage: Event

Manual operation: See "Search Mode for Next Peak" on page 116

CALCulate<n>:DELTamarker<m>:MAXimum[:PEAK]

This command moves a delta marker to the highest level.

If the marker is not yet active, the command first activates the marker.

Usage: Event

Manual operation: See "Peak Search" on page 118

CALCulate<n>:DELTamarker<m>:MINimum:LEFT

This command moves a delta marker to the next higher minimum value.

The search includes only measurement values to the right of the current marker position.

Usage: Event

Manual operation: See "Search Mode for Next Peak" on page 116

CALCulate<n>:DELTamarker<m>:MINimum:NEXT

This command moves a marker to the next higher minimum value.

Usage: Event

Manual operation: See "Search Mode for Next Peak" on page 116
See "Search Next Minimum" on page 118

CALCulate<n>:DELTamarker<m>:MINimum:RIGHt

This command moves a delta marker to the next higher minimum value.

The search includes only measurement values to the right of the current marker position.

Usage: Event

Manual operation: See "Search Mode for Next Peak" on page 116

CALCulate<n>:DELTamarker<m>:MINimum[:PEAK]

This command moves a delta marker to the minimum level.

If the marker is not yet active, the command first activates the marker.

Usage: Event

Manual operation: See "Search Minimum" on page 118

11.11 Importing and Exporting I/Q Data and Results

For details on importing and exporting I/Q data see chapter 5, "I/Q Data Import and Export", on page 50.

MMEMory:LOAD:IQ:STATe....245
MMEMory:STORe:IQ:COMMent....246
MMEMory:STORe:IQ:STATe....246

MMEMory:LOAD:IQ:STATe 1,<FileName>

This command restores I/Q data from a file.

The file extension is *.iq.tar.

Parameters:
<FileName> String containing the path and name of the source file.

Example:
```
MMEM:LOAD:IQ:STAT 1, 'C:
\R_S\Instr\user\data.iq.tar'
```
Loads IQ data from the specified file.

Usage: Setting only

Manual operation: See "Import" on page 51
See "IQ Import" on page 51

MMEMory:STORe:IQ:COMMent <Comment>

This command adds a comment to a file that contains I/Q data.

Parameters:

<Comment> String containing the comment.

Example: `MMEM:STOR:IQ:COMM 'Device test 1b'`
Creates a description for the export file.
`MMEM:STOR:IQ:STAT 1, 'C:\R_S\Instr\user\data.iq.tar'`
Stores I/Q data and the comment to the specified file.

Manual operation: See "Export" on page 50
See "IQ Export" on page 50

MMEMory:STORe:IQ:STATe 1, <FileName>

This command writes the captured I/Q data to a file.

The file extension is *.iq.tar. By default, the contents of the file are in 32-bit floating point format.

Parameters:

1

<FileName> String containing the path and name of the target file.

Example: `MMEM:STOR:IQ:STAT 1, 'C:\R_S\Instr\user\data.iq.tar'`
Stores the captured I/Q data to the specified file.

Manual operation: See "Export" on page 50
See "IQ Export" on page 50

11.12 Configuring the Application Data Range (MSRA mode only)

In MSRA operating mode, only the MSRA Master actually captures data; the MSRA applications define an extract of the captured data for analysis, referred to as the **application data**.

For the CDMA2000 BTS application, the application data range is defined by the same commands used to define the signal capture in Signal and Spectrum Analyzer mode (see `[SENSe:]CDPower:SET:COUNt` on page 183). Be sure to select the correct measurement channel before executing this command.

In addition, a capture offset can be defined, i.e. an offset from the start of the captured data to the start of the application data for the 3GPP FDD BTS measurement.

The **analysis interval** used by the individual result displays cannot be edited, but is determined automatically. However, you can query the currently used analysis interval for a specific window.

The **analysis line** is displayed by default but can be hidden or re-positioned.

Remote commands exclusive to MSRA applications

The following commands are only available for MSRA application channels:

CALCulate:MSRA:ALINe:SHOW....247
CALCulate:MSRA:ALINe[:VALue]....247
CALCulate:MSRA:WINDow<n>:IVAL?....247
INITiate:REFResh....248
[SENSe:]MSRA:CAPTure:OFFSet....248

CALCulate:MSRA:ALINe:SHOW

This command defines whether or not the analysis line is displayed in all time-based windows in all MSRA applications and the MSRA Master.

Note: even if the analysis line display is off, the indication whether or not the currently defined line position lies within the analysis interval of the active application remains in the window title bars.

Parameters:

<State> ON | OFF

*RST: ON

CALCulate:MSRA:ALINe[:VALue] <Position>

This command defines the position of the analysis line for all time-based windows in all MSRA applications and the MSRA Master.

Parameters:

<Position> Position of the analysis line in seconds. The position must lie within the measurement time of the MSRA measurement.

Default unit: s

CALCulate:MSRA:WINDow<n>:IVAL?

This command queries the analysis interval for the window specified by the index <n>. This command is only available in application measurement channels, not the MSRA View or MSRA Master.

Return values:

<IntStart> Start value of the analysis interval in seconds

Default unit: s

<IntStop> Stop value of the analysis interval in seconds

Usage: Query only

INITiate:REFResh

This function is only available if the Sequencer is deactivated (SYSTem:SEQuencer SYST:SEQ:OFF) and only for applications in MSRA mode, not the MSRA Master.

The data in the capture buffer is re-evaluated by the currently active application only. The results for any other applications remain unchanged.

Example:
```
SYST:SEQ:OFF
```
Deactivates the scheduler
```
INIT:CONT OFF
```
Switches to single sweep mode.
```
INIT;*WAI
```
Starts a new data measurement and waits for the end of the sweep.
```
INST:SEL 'IQ ANALYZER'
```
Selects the IQ Analyzer channel.
```
INIT:REFR
```
Refreshes the display for the I/Q Analyzer channel.

Usage: Event

[SENSe:]MSRA:CAPTure:OFFSet <Offset>

This setting is only available for applications in MSRA mode, not for the MSRA Master. It has a similar effect as the trigger offset in other measurements.

Parameters:

<Offset> This parameter defines the time offset between the capture buffer start and the start of the extracted application data. The offset must be a positive value, as the application can only analyze data that is contained in the capture buffer.

Range: 0 to <Record length>
*RST: 0

Manual operation: See "Trigger Source" on page 83
See "Capture Offset" on page 86

11.13 Querying the Status Registers

The following commands query the status registers specific to the CDMA2000 applications. In addition, the CDMA2000 applications also use the standard status registers of the R&S FSW.

For details on the common R&S FSW status registers refer to the description of remote commands basics in the R&S FSW User Manual.

*RST does not influence the status registers.

The STATus:QUEStionable:DIQ register is described in "STATus:QUEStionable:DIQ Register" on page 157.

The STATus:QUEStionable:SYNC register contains information on the error situation in the code domain analysis of the cdma2000 applications. The bits can be queried with commands STATus:QUEStionable:SYNC:CONDition? on page 249 and STATus:QUEStionable:SYNC[:EVENt]? on page 249.

Table 11-7: Status error bits in STATus:QUEStionable:SYNC register for CDMA2000 applications

Bit No	Meaning
0	This bit is not used.
1	Frame Sync failed. This bit is set when synchronization is not possible within the application. Possible reasons: • Incorrectly set frequency • Incorrectly set level • Incorrectly set PN Offset • Incorrectly set values for Swap IQ • Invalid signal at input
2 to 14	These bits are not used.
15	This bit is always 0.

STATus:QUEStionable:SYNC[:EVENt]?....249
STATus:QUEStionable:SYNC:CONDition?....249
STATus:QUEStionable:SYNC:ENABle....250
STATus:QUEStionable:SYNC:NTRansition....250
STATus:QUEStionable:SYNC:PTRansition....250

STATus:QUEStionable:SYNC[:EVENt]? <ChannelName>

This command reads out the EVENt section of the status register.

The command also deletes the contents of the EVENt section.

Query parameters:

<ChannelName> String containing the name of the channel.
The parameter is optional. If you omit it, the command works for the currently active channel.

Usage: Query only

STATus:QUEStionable:SYNC:CONDition? <ChannelName>

This command reads out the CONDition section of the status register.

The command does not delete the contents of the EVENt section.

Query parameters:

<ChannelName> String containing the name of the channel.
The parameter is optional. If you omit it, the command works for the currently active channel.

Usage: Query only

STATus:QUEStionable:SYNC:ENABle <BitDefinition>, <ChannelName>

This command controls the ENABle part of a register.

The ENABle part allows true conditions in the EVENt part of the status register to be reported in the summary bit. If a bit is 1 in the enable register and its associated event bit transitions to true, a positive transition will occur in the summary bit reported to the next higher level.

Parameters:

<BitDefinition> Range: 0 to 65535

<ChannelName> String containing the name of the channel.
The parameter is optional. If you omit it, the command works for the currently active channel.

STATus:QUEStionable:SYNC:NTRansition <BitDefinition>,<ChannelName>

This command controls the Negative TRansition part of a register.

Setting a bit causes a 1 to 0 transition in the corresponding bit of the associated register. The transition also writes a 1 into the associated bit of the corresponding EVENt register.

Parameters:

<BitDefinition> Range: 0 to 65535

<ChannelName> String containing the name of the channel.
The parameter is optional. If you omit it, the command works for the currently active channel.

STATus:QUEStionable:SYNC:PTRansition <BitDefinition>,<ChannelName>

These commands control the Positive TRansition part of a register.

Setting a bit causes a 0 to 1 transition in the corresponding bit of the associated register. The transition also writes a 1 into the associated bit of the corresponding EVENt register.

Parameters:

<BitDefinition> Range: 0 to 65535

<ChannelName> String containing the name of the channel.
The parameter is optional. If you omit it, the command works for the currently active channel.

11.14 Commands for Compatibility

The following commands are provided for compatibility to other signal analyzers only. For new remote commands programs use the specified alternative commands.

CALCulate<n>:FEED....251
[SENSe:]CDPower:LEVel:ADJust....251
[SENSe:]CDPower:PRESet....252

CALCulate<n>:FEED <Evaluation>

This command selects the evaluation method of the measured data that is to be displayed in the specified window.

Note that this command is maintained for compatibility reasons only. Use the `LAYout` commands for new remote control programs (see chapter 11.7.2, "Working with Windows in the Display", on page 201).

Parameters:

<Evaluation> Type of evaluation you want to display.
See the table below for available parameter values.

Example: `CALC:FEED 'XPOW:CDP'`
Selects the Code Domain Power result display.

Table 11-8: <Evaluation> parameter values

String Parameter	Text Parameter	Evaluation
'XTIM:CDP:BSTReam'	BITStream	Bitstream
'XTIM:CDP:COMP:CONStellation'	CCONst	Composite Constellation
'XPOW:CDEPower'	CDEPower	Code Domain Error Power
'XTIM:CDP:COMP:EVM'	CDEVm	Composite EVM
'XPOW:CDP:RATio'	CDPower	Code Domain Power
'XTIM:CDP:MACCuracy'	CEVM	Composite EVM
'XTIM:CDP:ERR:CTABle'	CTABle	Channel Table
'XTIM:CDP:ERR:PCDomain'	PCDerror	Peak Code Domain Error
'XTIM:CDP:PVSYmbol'	PSYMbol	Power vs Symbol
'XTIM:CDP:ERR:SUMMary'	RSUMmary	Result Summary
'XPOW:CDP:RATio'	SCONst	Symbol Constellation
'XTIM:CDP:SYMB:EVM'	SEVM	Symbol EVM

[SENSe:]CDPower:LEVel:ADJust

This command adjusts the reference level to the measured channel power. This ensures that the settings of the RF attenuation and the reference level are optimally adjusted to the signal level without overloading the R&S FSW or limiting the dynamic range by an S/N ratio that is too small.

Note that this command is retained for compatibility reasons only. For new R&S FSW programs use `[SENSe:]ADJust:LEVel` on page 194.

[SENSe:]CDPower:PRESet

This command resets the CDMA2000 channel to its predefined settings. Any RF measurement is aborted and the measurement type is reset to Code Domain Analysis.

Note that this command is retained for comaptibility reasons only. For new remote control programs use the `SYSTem:PRESet:CHANnel[:EXECute]` command.

Usage: Event

A Annex - Reference Data

A.1 Reference: Predefined Channel Tables

Predefined channel tables provide quick configuration for the channel search in commonly used measurement scenarios in accordance with the cdma2000 specification.

To use channels other than those in the predefined channel tables, you can copy the original tables and modify the channels in the copy.

- BTS Channel Tables....253
- MS Channel Tables....255

A.1.1 BTS Channel Tables

The cdma2000 BTS Analysis application provides the following set of channel tables compliant with the cdma2000 specification:

The standard does not specify a channel number for the data channels.

Channel table	Contents
RECENT	Contains the most recently selected channel table
MPC_RC1	Base Station **M**ain **P**ath 6 **C**hannels **R**adio **C**onfiguration **1** Channel table with F-PICH/F-SYNC/F-PCH and 6 data channels.
MPC_RC4	Base Station **M**ain **P**ath 6 **C**hannels **R**adio **C**onfiguration **4** Channel table with F-PICH/F-SYNC/F-PCH and 6 data channels.
TDC_RC4	Base Station **T**ransmit **D**iversity Path 6 **C**hannels **R**adio **C**onfiguration 4 Channel table with F-PICH/F-SYNC/F-PCH and 6 data channels.
BPC_RC4	Base Station **B**oth **P**aths 6 **C**hannels **R**adio **C**onfiguration 4 Channel table with F-PICH/F-TDPICH/F-SYNC/F-PCH and 6 data channels

Table 1-1: Base station channel table for main branch in radio configuration 1 (MPC_RC1)

Channel Type	Number of Channels	Code Channel (Walsh Code.SF)	Radio Configuration
F-PICH	1	0.64	-
F-SYNC	1	32.64	-

Channel Type	Number of Channels	Code Channel (Walsh Code.SF)	Radio Configuration
F-PCH	1	1.64	-
F-CHAN	6	9.64 10.64 11.64 15.64 17.64 25.64	1 1 1 1 1 1

Table 1-2: Base station channel table for main branch in radio configuration 4 (MPC_RC4)

Channel Type	Number of Channels	Code Channel (Walsh Code.SF)	Radio Configuration
F-PICH	1	0.64	-
F-SYNC	1	32.64	-
F-PCH	1	1.64	-
F-CHAN	6	9.128 10.128 11.128 15.128 17.128 25.128	4 4 4 4 4 4

Table 1-3: Base station test model for aggregate signal in radio configuration 4 (TDC_RC4)

Channel Type	Number of Channels	Code Channel (Walsh Code.SF)	Radio Configuration
F-PICH	1	16.128	-
F-SYNC	1	32.64	-
F-PCH	1	1.64	-
F-CHAN	6	9.128 10.128 11.128 15.128 17.128 25.128	4 4 4 4 4 4

Table 1-4: Base station test model for aggregate signal in radio configuration 4 (BPC_RC4)

Channel Type	Number of Channels	Code Channel (Walsh Code.SF)	Radio Configuration
F-PICH	1	0.64	-
TDPICH	1	16.128	-
F-SYNC	1	32.64	-

Channel Type	Number of Channels	Code Channel (Walsh Code.SF)	Radio Configuration
F-PCH	1	1.64	-
F-CHAN	6	9.128 10.128 11.128 15.128 17.128 25.128	4 4 4 4 4 4

A.1.2 MS Channel Tables

The cdma2000 MS application provides the following set of channel tables compliant with the cdma2000 specification:

Channel table	Contents
RECENT	Contains the channels that were automatically created during the last measurement with the "Auto Search" option activated (for details refer to "Using Predefined Channel Tables" on page 90).
EACHOP	Channel table for **E**nhanced **A**ccess **CH**annel **OP**eration with PICH and EACH
RCCCHOP	Channel table for **R**everse **C**ommon **C**ontrol **CH**annel **OP**eration with PICH and CCCH
RTCHOP3	Channel table for **R**everse **T**raffic **CH**annel **OP**eration with the following 3 channels: • PICH • DCCH • FCH
RTCHOP5	Channel table for **R**everse **T**raffic **CH**annel **OP**eration with the following 5 channels: • PICH • DCCH • FCH • S1CH • S2CH

Table 1-5: Channel table for enhanced access channel operation

Channel type	Code channel (Walsh Code.SF)	Mapping
PICH	0.32	I
EACH	2.8	Q

Table 1-6: Channel table for reverse commom control channel operation

Channel type	Code channel (Walsh Code.SF)	Mapping
PICH	0.32	I
CCCH	2.8	Q

Table 1-7: Channel table for REVERSE TRAFFIC CHANNEL OPERATION 3

Channel type	Code channel (Walsh Code.SF)	Mapping
PICH	0.32	I
FCH	4.16	Q
S1CH	2.4	Q

Table 1-8: Channel table for REVERSE TRAFFIC CHANNEL OPERATION 5

Channel type	Code channel (Walsh Code.SF)	Mapping
PICH	0.32	I
DCCH	8.16	I
FCH	4.16	Q
S1CH	2.4	Q
S2CH	6.8	I

A.2 Reference: Code Tables

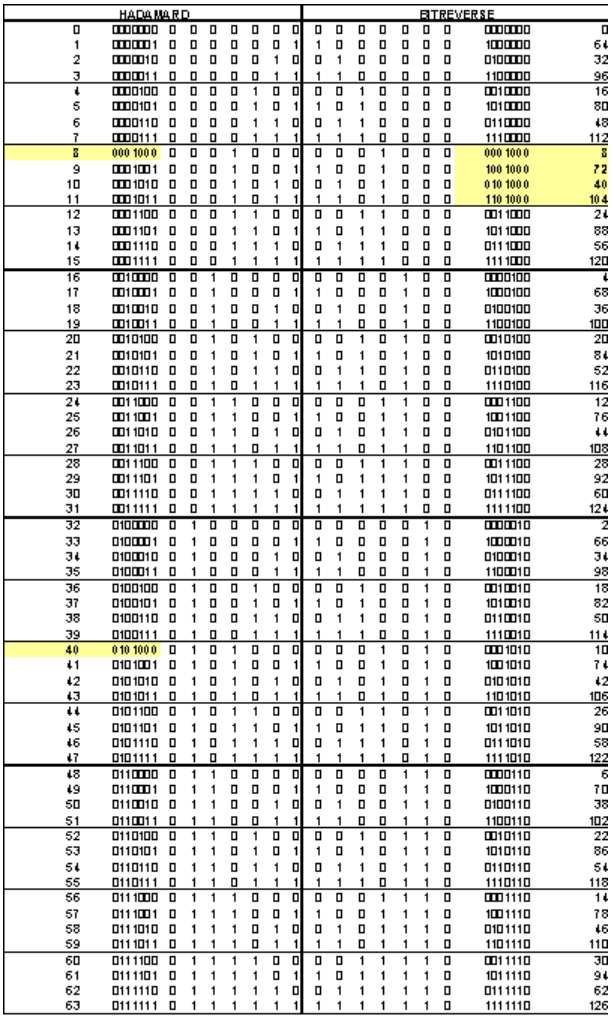
Hadamard and BitReverse Code Tables

The following tables show the code sequences with Hadamard and BitReverse orders for the Code Domain Power and Code Domain Error Power result displays.

As an example, the corresponding cells for channel 8.32 (channel number 8 for spreading factor 32) are marked to show where the different codes of this channel are located.

	HADAMARD							BITREVERSE							
0	000000	0	0	0	0	0	0	0	0	0	0	0	0	000000	0
1	000001	0	0	0	0	0	1	1	0	0	0	0	0	100000	32
2	000010	0	0	0	0	1	0	0	1	0	0	0	0	010000	16
3	000011	0	0	0	0	1	1	1	1	0	0	0	0	110000	48
4	000100	0	0	0	1	0	0	0	0	1	0	0	0	001000	8
5	000101	0	0	0	1	0	1	1	0	1	0	0	0	101000	40
6	000110	0	0	0	1	1	0	0	1	1	0	0	0	011000	24
7	000111	0	0	0	1	1	1	1	1	1	0	0	0	111000	56
8	001000	0	0	1	0	0	0	0	0	0	1	0	0	000100	4
9	001001	0	0	1	0	0	1	1	0	0	1	0	0	100100	36
10	001010	0	0	1	0	1	0	0	1	0	1	0	0	010100	20
11	001011	0	0	1	0	1	1	1	1	0	1	0	0	110100	52
12	001100	0	0	1	1	0	0	0	0	1	1	0	0	001100	12
13	001101	0	0	1	1	0	1	1	0	1	1	0	0	101100	44
14	001110	0	0	1	1	1	0	0	1	1	1	0	0	011100	28
15	001111	0	0	1	1	1	1	1	1	1	1	0	0	111100	60
16	010000	0	1	0	0	0	0	0	0	0	0	1	0	000010	2
17	010001	0	1	0	0	0	1	1	0	0	0	1	0	100010	34
18	010010	0	1	0	0	1	0	0	1	0	0	1	0	010010	18
19	010011	0	1	0	0	1	1	1	1	0	0	1	0	110010	50
20	010100	0	1	0	1	0	0	0	0	1	0	1	0	001010	10
21	010101	0	1	0	1	0	1	1	0	1	0	1	0	101010	42
22	010110	0	1	0	1	1	0	0	1	1	0	1	0	011010	26
23	010111	0	1	0	1	1	1	1	1	1	0	1	0	111010	58
24	011000	0	1	1	0	0	0	0	0	0	1	1	0	000110	6
25	011001	0	1	1	0	0	1	1	0	0	1	1	0	100110	38
26	011010	0	1	1	0	1	0	0	1	0	1	1	0	010110	22
27	011011	0	1	1	0	1	1	1	1	0	1	1	0	110110	54
28	011100	0	1	1	1	0	0	0	0	1	1	1	0	001110	14
29	011101	0	1	1	1	0	1	1	0	1	1	1	0	101110	46
30	011110	0	1	1	1	1	0	0	1	1	1	1	0	011110	30
31	011111	0	1	1	1	1	1	1	1	1	1	1	0	111110	62
32	100000	1	0	0	0	0	0	0	0	0	0	0	1	000001	1
33	100001	1	0	0	0	0	1	1	0	0	0	0	1	100001	33
34	100010	1	0	0	0	1	0	0	1	0	0	0	1	010001	17
35	100011	1	0	0	0	1	1	1	1	0	0	0	1	110001	49
36	100100	1	0	0	1	0	0	0	0	1	0	0	1	001001	9
37	100101	1	0	0	1	0	1	1	0	1	0	0	1	101001	41
38	100110	1	0	0	1	1	0	0	1	1	0	0	1	011001	25
39	100111	1	0	0	1	1	1	1	1	1	0	0	1	111001	57
40	101000	1	0	1	0	0	0	0	0	0	1	0	1	000101	5
41	101001	1	0	1	0	0	1	1	0	0	1	0	1	100101	37
42	101010	1	0	1	0	1	0	0	1	0	1	0	1	010101	21
43	101011	1	0	1	0	1	1	1	1	0	1	0	1	110101	53
44	101100	1	0	1	1	0	0	0	0	1	1	0	1	001101	13
45	101101	1	0	1	1	0	1	1	0	1	1	0	1	101101	45
46	101110	1	0	1	1	1	0	0	1	1	1	0	1	011101	29
47	101111	1	0	1	1	1	1	1	1	1	1	0	1	111101	61
48	110000	1	1	0	0	0	0	0	0	0	0	1	1	000011	3
49	110001	1	1	0	0	0	1	1	0	0	0	1	1	100011	35
50	110010	1	1	0	0	1	0	0	1	0	0	1	1	010011	19
51	110011	1	1	0	0	1	1	1	1	0	0	1	1	110011	51
52	110100	1	1	0	1	0	0	0	0	1	0	1	1	001011	11
53	110101	1	1	0	1	0	1	1	0	1	0	1	1	101011	43
54	110110	1	1	0	1	1	0	0	1	1	0	1	1	011011	27
55	110111	1	1	0	1	1	1	1	1	1	0	1	1	111011	59
56	111000	1	1	1	0	0	0	0	0	0	1	1	1	000111	7
57	111001	1	1	1	0	0	1	1	0	0	1	1	1	100111	39
58	111010	1	1	1	0	1	0	0	1	0	1	1	1	010111	23
59	111011	1	1	1	0	1	1	1	1	0	1	1	1	110111	55
60	111100	1	1	1	1	0	0	0	0	1	1	1	1	001111	15
61	111101	1	1	1	1	0	1	1	0	1	1	1	1	101111	47
62	111110	1	1	1	1	1	0	0	1	1	1	1	1	011111	31
63	111111	1	1	1	1	1	1	1	1	1	1	1	1	111111	63

Fig. 1-1: Codetable for base spreading factor 64



	HADAMARD								BITREVERSE								
0	0000000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0000000	0
1	0000001	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1000000	64
2	0000010	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0100000	32
3	0000011	0	0	0	0	0	1	1	1	1	0	0	0	0	0	1100000	96
4	0000100	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0010000	16
5	0000101	0	0	0	0	1	0	1	1	0	1	0	0	0	0	1010000	80
6	0000110	0	0	0	0	1	1	0	0	1	1	0	0	0	0	0110000	48
7	0000111	0	0	0	0	1	1	1	1	1	1	0	0	0	0	1110000	112
8	0001000	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0001000	8
9	0001001	0	0	0	1	0	0	1	1	0	0	1	0	0	0	1001000	72
10	0001010	0	0	0	1	0	1	0	0	1	0	1	0	0	0	0101000	40
11	0001011	0	0	0	1	0	1	1	1	1	0	1	0	0	0	1101000	104
12	0001100	0	0	0	1	1	0	0	0	0	1	1	0	0	0	0011000	24
13	0001101	0	0	0	1	1	0	1	1	0	1	1	0	0	0	1011000	88
14	0001110	0	0	0	1	1	1	0	0	1	1	1	0	0	0	0111000	56
15	0001111	0	0	0	1	1	1	1	1	1	1	1	0	0	0	1111000	120
16	0010000	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0000100	4
17	0010001	0	0	1	0	0	0	1	1	0	0	0	1	0	0	1000100	68
18	0010010	0	0	1	0	0	1	0	0	1	0	0	1	0	0	0100100	36
19	0010011	0	0	1	0	0	1	1	1	1	0	0	1	0	0	1100100	100
20	0010100	0	0	1	0	1	0	0	0	0	1	0	1	0	0	0010100	20
21	0010101	0	0	1	0	1	0	1	1	0	1	0	1	0	0	1010100	84
22	0010110	0	0	1	0	1	1	0	0	1	1	0	1	0	0	0110100	52
23	0010111	0	0	1	0	1	1	1	1	1	1	0	1	0	0	1110100	116
24	0011000	0	0	1	1	0	0	0	0	0	0	1	1	0	0	0001100	12
25	0011001	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1001100	76
26	0011010	0	0	1	1	0	1	0	0	1	0	1	1	0	0	0101100	44
27	0011011	0	0	1	1	0	1	1	1	1	0	1	1	0	0	1101100	108
28	0011100	0	0	1	1	1	0	0	0	0	1	1	1	0	0	0011100	28
29	0011101	0	0	1	1	1	0	1	1	0	1	1	1	0	0	1011100	92
30	0011110	0	0	1	1	1	1	0	0	1	1	1	1	0	0	0111100	60
31	0011111	0	0	1	1	1	1	1	1	1	1	1	1	0	0	1111100	124
32	0100000	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0000010	2
33	0100001	0	1	0	0	0	0	1	1	0	0	0	0	1	0	1000010	66
34	0100010	0	1	0	0	0	1	0	0	1	0	0	0	1	0	0100010	34
35	0100011	0	1	0	0	0	1	1	1	1	0	0	0	1	0	1100010	98
36	0100100	0	1	0	0	1	0	0	0	0	1	0	0	1	0	0010010	18
37	0100101	0	1	0	0	1	0	1	1	0	1	0	0	1	0	1010010	82
38	0100110	0	1	0	0	1	1	0	0	1	1	0	0	1	0	0110010	50
39	0100111	0	1	0	0	1	1	1	1	1	1	0	0	1	0	1110010	114
40	0101000	0	1	0	1	0	0	0	0	0	0	1	0	1	0	0001010	10
41	0101001	0	1	0	1	0	0	1	1	0	0	1	0	1	0	1001010	74
42	0101010	0	1	0	1	0	1	0	0	1	0	1	0	1	0	0101010	42
43	0101011	0	1	0	1	0	1	1	1	1	0	1	0	1	0	1101010	106
44	0101100	0	1	0	1	1	0	0	0	0	1	1	0	1	0	0011010	26
45	0101101	0	1	0	1	1	0	1	1	0	1	1	0	1	0	1011010	90
46	0101110	0	1	0	1	1	1	0	0	1	1	1	0	1	0	0111010	58
47	0101111	0	1	0	1	1	1	1	1	1	1	1	0	1	0	1111010	122
48	0110000	0	1	1	0	0	0	0	0	0	0	0	1	1	0	0000110	6
49	0110001	0	1	1	0	0	0	1	1	0	0	0	1	1	0	1000110	70
50	0110010	0	1	1	0	0	1	0	0	1	0	0	1	1	0	0100110	38
51	0110011	0	1	1	0	0	1	1	1	1	0	0	1	1	0	1100110	102
52	0110100	0	1	1	0	1	0	0	0	0	1	0	1	1	0	0010110	22
53	0110101	0	1	1	0	1	0	1	1	0	1	0	1	1	0	1010110	86
54	0110110	0	1	1	0	1	1	0	0	1	1	0	1	1	0	0110110	54
55	0110111	0	1	1	0	1	1	1	1	1	1	0	1	1	0	1110110	118
56	0111000	0	1	1	1	0	0	0	0	0	0	1	1	1	0	0001110	14
57	0111001	0	1	1	1	0	0	1	1	0	0	1	1	1	0	1001110	78
58	0111010	0	1	1	1	0	1	0	0	1	0	1	1	1	0	0101110	46
59	0111011	0	1	1	1	0	1	1	1	1	0	1	1	1	0	1101110	110
60	0111100	0	1	1	1	1	0	0	0	0	1	1	1	1	0	0011110	30
61	0111101	0	1	1	1	1	0	1	1	0	1	1	1	1	0	1011110	94
62	0111110	0	1	1	1	1	1	0	0	1	1	1	1	1	0	0111110	62
63	0111111	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1111110	126

Fig. 1-2: Code table for base spreading factor 128 (part1)

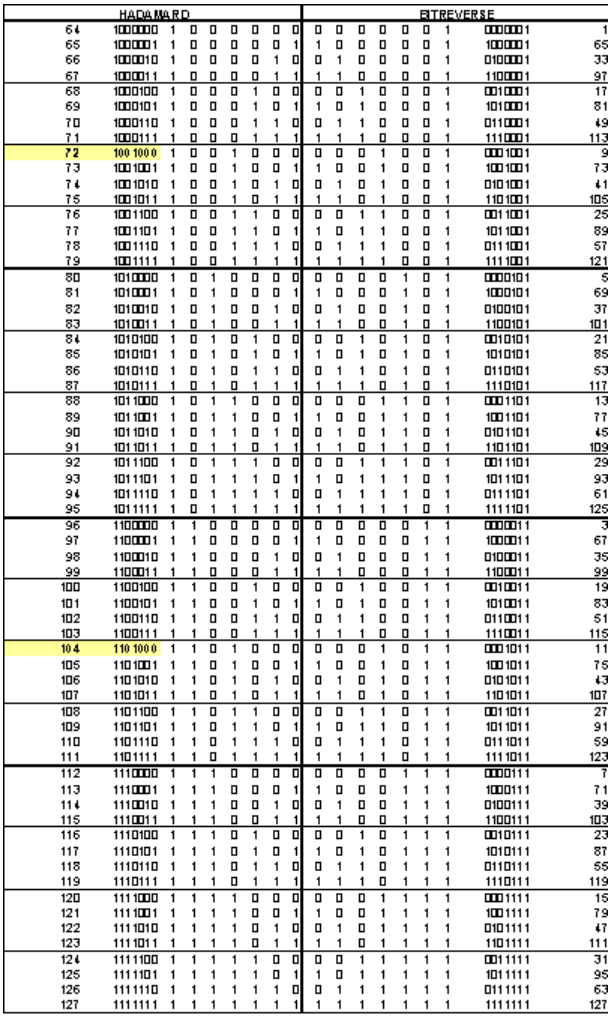


Fig. 1-3: Code table for base spreading factor 128 (part 2)

A.3 Reference: Supported Bandclasses

The bandclass defines the frequency band used for ACLR and SEM measurements. It also determines the corresponding limits and ACLR channel settings according to the CDMA2000 standard. The used bandclass is defined in the SEM or ACLR measurement settings (see "Bandclass" on page 104).

Table 1-9: Supported bandclasses for CDMA2000 RF measurements

Bandclass	SCPI para	Description
0	0	800 MHz Cellular Band
1	1	1.9 GHz PCS Band
2	2	TACS Band

Bandclass	SCPI para	Description
3A	3	JTACS Band: >832 MHz and ≤ 834 MHz >838 MHz and ≤ 846 MHz >860 MHz and ≤ 895 MHz
3B	**21**	JTACS Band: >810 MHz and ≤ 860 MHz except: >832 MHz and ≤ 834 MHz >838 MHz and ≤ 846 MHz
3C	**22**	JTACS Band: ≤810 MHz and >895 MHz
4	4	Korean PCS Band
5	5	450 MHz NMT Band
6	6	2 GHz IMT-2000 Band
7	7	700 MHz Band
8	8	1800 MHz Band
9	9	900 MHz Band
10	10	Secondary 800 MHz
11	11	400 MHz European PAMR Band
12	12	800 MHz PAMR Band
13	13	2.5 GHz IMT-2000 Extension Band
14	14	US PCS 1.9 GHz Band
15	15	AWS Band
16	16	US 2.5 GHz Band
17	17	US 2.5 GHz Forward Link Only Band

A.4 Reference: I/Q Data File Format (iq-tar)

I/Q data is stored in a compressed format with the file extension `.iq.tar`. An iq-tar file contains I/Q data in binary format together with meta information that describes the nature and the source of data, e.g. the sample rate. The objective of the iq-tar file format is to separate I/Q data from the meta information while still having both inside one file. In addition, the file format allows you to preview the I/Q data in a web browser, and allows you to include user-specific data.

Contained files

An iq-tar file must contain the following files:

- **I/Q parameter XML file**, e.g. `xyz.xml`
  Contains meta information about the I/Q data (e.g. sample rate). The filename can be defined freely, but there must be only one single I/Q parameter XML file inside an iq-tar file.
- **I/Q data binary file**, e.g. `xyz.complex.float32`
  Contains the binary I/Q data of all channels. There must be only one single I/Q data binary file inside an iq-tar file.

Optionally, an iq-tar file can contain the following file:

- **I/Q preview XSLT file**, e.g. `open_IqTar_xml_file_in_web_browser.xslt`
  Contains a stylesheet to display the I/Q parameter XML file and a preview of the I/Q data in a web browser.

A.4.1 I/Q Parameter XML File Specification

The content of the I/Q parameter XML file must comply with the XML schema `RsIqTar.xsd` available at: http://www.rohde-schwarz.com/file/RsIqTar.xsd.

In particular, the order of the XML elements must be respected, i.e. iq-tar uses an "ordered XML schema". For your own implementation of the iq-tar file format make sure to validate your XML file against the given schema.

The following example shows an I/Q parameter XML file. The XML elements and attributes are explained in the following sections.

Sample I/Q parameter XML file: xyz.xml

```
<?xml version="1.0" encoding="UTF-8"?>
<?xml-stylesheet type="text/xsl"
href="open_IqTar_xml_file_in_web_browser.xslt"?>
<RS_IQ_TAR_FileFormat fileFormatVersion="1"
xsi:noNamespaceSchemaLocation="RsIqTar.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <Name>FSV-K10</Name>
  <Comment>Here is a comment</Comment>
  <DateTime>2011-01-24T14:02:49</DateTime>
  <Samples>68751</Samples>
  <Clock unit="Hz">6.5e+006</Clock>
  <Format>complex</Format>
  <DataType>float32</DataType>
  <ScalingFactor unit="V">1</ScalingFactor>
  <NumberOfChannels>1</NumberOfChannels>
<DataFilename>xyz.complex.float32</DataFilename>
<UserData>
  <UserDefinedElement>Example</UserDefinedElement>
</UserData>
```

```
  <PreviewData>...</PreviewData>
</RS_IQ_TAR_FileFormat>
```

Element	Description
RS_IQ_TAR_FileFormat	The root element of the XML file. It must contain the attribute `fileFormatVersion` that contains the number of the file format definition. Currently, `fileFormatVersion` "2" is used.
Name	Optional: describes the device or application that created the file.
Comment	Optional: contains text that further describes the contents of the file.
DateTime	Contains the date and time of the creation of the file. Its type is `xs:dateTime` (see `RsIqTar.xsd`).
Samples	Contains the number of samples of the I/Q data. For multi-channel signals all channels have the same number of samples. One sample can be: • A complex number represented as a pair of I and Q values • A complex number represented as a pair of magnitude and phase values • A real number represented as a single real value See also `Format` element.
Clock	Contains the clock frequency in Hz, i.e. the sample rate of the I/Q data. A signal generator typically outputs the I/Q data at a rate that equals the clock frequency. If the I/Q data was captured with a signal analyzer, the signal analyzer used the clock frequency as the sample rate. The attribute `unit` must be set to "Hz".
Format	Specifies how the binary data is saved in the I/Q data binary file (see `DataFilename` element). Every sample must be in the same format. The format can be one of the following: • Complex: Complex number in cartesian format, i.e. I and Q values interleaved. I and Q are unitless • Real: Real number (unitless) • Polar: Complex number in polar format, i.e. magnitude (unitless) and phase (rad) values interleaved. Requires `DataType` = `float32` or `float64`
DataType	Specifies the binary format used for samples in the I/Q data binary file (see `DataFilename` element and chapter A.4.2, "I/Q Data Binary File", on page 264). The following data types are allowed: • int8: 8 bit signed integer data • int16: 16 bit signed integer data • int32: 32 bit signed integer data • float32: 32 bit floating point data (IEEE 754) • float64: 64 bit floating point data (IEEE 754)
ScalingFactor	Optional: describes how the binary data can be transformed into values in the unit Volt. The binary I/Q data itself has no unit. To get an I/Q sample in the unit Volt the saved samples have to be multiplied by the value of the `ScalingFactor`. For polar data only the magnitude value has to be multiplied. For multi-channel signals the `ScalingFactor` must be applied to all channels. The `ScalingFactor` must be > 0. If the `ScalingFactor` element is not defined, a value of 1 V is assumed.
NumberOfChannels	Optional: specifies the number of channels, e.g. of a MIMO signal, contained in the I/Q data binary file. For multi-channels, the I/Q samples of the channels are expected to be interleaved within the I/Q data file (see chapter A.4.2, "I/Q Data Binary File", on page 264). If the `NumberOfChannels` element is not defined, one channel is assumed.

Element	Description
DataFilename	Contains the filename of the I/Q data binary file that is part of the iq-tar file. It is recommended that the filename uses the following convention: <xyz>.<Format>.<Channels>ch.<Type> • <xyz> = a valid Windows file name • <Format> = complex, polar or real (see `Format` element) • <Channels> = Number of channels (see `NumberOfChannels` element) • <Type> = float32, float64, int8, int16, int32 or int64 (see `DataType` element) Examples: • xyz.complex.1ch.float32 • xyz.polar.1ch.float64 • xyz.real.1ch.int16 • xyz.complex.16ch.int8
UserData	Optional: contains user, application or device-specific XML data which is not part of the iq-tar specification. This element can be used to store additional information, e.g. the hardware configuration. It is recommended that you add user data as XML content.
PreviewData	Optional: contains further XML elements that provide a preview of the I/Q data. The preview data is determined by the routine that saves an iq-tar file (e.g. R&S FSW). For the definition of this element refer to the `RsIqTar.xsd` schema. Note that the preview can be only displayed by current web browsers that have JavaScript enabled and if the XSLT stylesheet `open_IqTar_xml_file_in_web_browser.xslt` is available.

Example: ScalingFactor

Data stored as `int16` and a desired full scale voltage of 1 V

`ScalingFactor` = 1 V / maximum int16 value = 1 V / 2^{15} = 3.0517578125e-5 V

Scaling Factor	Numerical value	Numerical value x ScalingFactor
Minimum (negative) int16 value	- 2^{15} = - 32768	-1 V
Maximum (positive) int16 value	2^{15}-1= 32767	0.999969482421875 V

Example: PreviewData in XML

```
<PreviewData>
    <ArrayOfChannel length="1">
      <Channel>
        <PowerVsTime>
          <Min>
            <ArrayOfFloat length="256">
              <float>-95</float>
              <float>-94</float>
              ...
              <float>-93</float>
            </ArrayOfFloat>
          </Min>
          <Max>
            <ArrayOfFloat length="256">
              <float>0</float>
              <float>-41</float>
```

```
            ...
            <float>0</float>
          </ArrayOfFloat>
        </Max>
      </PowerVsTime>
      <Spectrum>
        <Min>
          <ArrayOfFloat length="256">
            <float>-107</float>
            <float>-96</float>
            ...
            <float>-94</float>
          </ArrayOfFloat>
        </Min>
        <Max>
          <ArrayOfFloat length="256">
            <float>-25</float>
            <float>1</float>
            ...
            <float>1</float>
          </ArrayOfFloat>
        </Max>
      </Spectrum>
    </Channel>
  </ArrayOfChannel>
</PreviewData>
```

A.4.2 I/Q Data Binary File

The I/Q data is saved in binary format according to the format and data type specified in the XML file (see `Format` element and `DataType` element). To allow reading and writing of streamed I/Q data all data is interleaved, i.e. complex values are interleaved pairs of I and Q values and multi-channel signals contain interleaved (complex) samples for channel 1, channel 2, channel 3 etc.

Example: NumberOfChannels - Element ordering for complex cartesian data

Complex data: I[channel no][time index], Q[channel no][time index]

```
I[0][0], Q[0][0],           // Channel 0, Complex sample 0
I[1][0], Q[1][0],           // Channel 1, Complex sample 0
I[2][0], Q[2][0],           // Channel 2, Complex sample 0

I[0][1], Q[0][1],           // Channel 0, Complex sample 1
I[1][1], Q[1][1],           // Channel 1, Complex sample 1
I[2][1], Q[2][1],           // Channel 2, Complex sample 1

I[0][2], Q[0][2],           // Channel 0, Complex sample 2
I[1][2], Q[1][2],           // Channel 1, Complex sample 2
```

```
I[2][2], Q[2][2],           // Channel 2, Complex sample 2

I[0][3], Q[0][3],           // Channel 0, Complex sample 3
I[1][3], Q[1][3],           // Channel 1, Complex sample 3
I[2][3], Q[2][3],           // Channel 2, Complex sample 3

...
```

A.5 Abbreviations

For a comprehensive glossary refer to the cdma2000 standard.

APICH	auxiliary pilot channel
ATDPCH	auxiliary transmit diversity pilot channel
BCH	broadcast channel
CACH	common assignment channel
CCCH	common control channel (2.8)
CDEP	code domain error power
CDP	code domain power
Composite EVM	in accordance with the cdma2000 specifications, determines the square root of the squared error between the real and the imaginary parts of the test signal and an ideally generated reference signal (EVM referred to the total signal) in a composite EVM measurement.
CPCCH	common power control channel
Crest factor	ratio of peak to average value of the signal
EACH	Enhanced access channel 2.8
FCH	Fundamental channel 4.16
Inactive Channel Threshold	minimum power that a single channel must have compared with the total signal to be recognized as an active channel.
MC1	multi-carrier1 (one carrier system 1X).
MC2	multi-carrier3 (three carrier system 3X).
OTD	orthogonal transmit diversity, two antennas used
PCG	power control group: name in cdma2000 system for 1536 chips or 1.25 ms interval; transmitter power is constant during a power control group
PCH	paging channel
PDCH	packet data channel
PDCCH	packet data control channel
PICH	pilot channel 0.64 (MS: 0.32)

RC	radio configuration; definition of sampling rate, permissible data rates, modulation types and use of special channels, and transmit diversity
S1CH	Supplemental 1 channel 1.2 or 2.4 (in higher layers this channel is also referred to as supplemental channel 0 – SCH0).
S2CH	Supplemental 2 channel 2.4 or 6.8 (in higher layers this channel is also referred to as supplemental channel 1 – SCH1).
SCH0	Refer to S1CH
SCH1	Refer to S2CH
Set	a group of 64 consecutive PCGs
SF	spreading factor
SYNC	synchronisation channel 32.64
TD	transmit diversity, two antennas used
TDPICH	transmit diversity pilot channel 16.128
x.y	Walsh code x.y, with code number x and spreading factor y of the channel

List of Remote Commands (CDMA2000)

ABORt....209
CALCulate:LIMit<k>:FAIL....233
CALCulate:MARKer:FUNCtion:POWer:RESult?....234
CALCulate:MSRA:ALINe:SHOW....247
CALCulate:MSRA:ALINe[:VALue]....247
CALCulate:MSRA:WINDow<n>:IVAL?....247
CALCulate:STATistics:RESult<t>?....236
CALCulate<n>:DELTamarker:AOFF....239
CALCulate<n>:DELTamarker<m>:MAXimum:LEFT....244
CALCulate<n>:DELTamarker<m>:MAXimum:NEXT....244
CALCulate<n>:DELTamarker<m>:MAXimum:RIGHt....244
CALCulate<n>:DELTamarker<m>:MAXimum[:PEAK]....244
CALCulate<n>:DELTamarker<m>:MINimum:LEFT....244
CALCulate<n>:DELTamarker<m>:MINimum:NEXT....244
CALCulate<n>:DELTamarker<m>:MINimum:RIGHt....245
CALCulate<n>:DELTamarker<m>:MINimum[:PEAK]....245
CALCulate<n>:DELTamarker<m>:X....240
CALCulate<n>:DELTamarker<m>:X:RELative?....240
CALCulate<n>:DELTamarker<m>:Y?....240
CALCulate<n>:DELTamarker<m>[:STATe]....239
CALCulate<n>:FEED....251
CALCulate<n>:MARKer<m>:AOFF....238
CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult?....215
CALCulate<n>:MARKer<m>:FUNCtion:PICH....242
CALCulate<n>:MARKer<m>:FUNCtion:TDPIch....242
CALCulate<n>:MARKer<m>:MAXimum:LEFT....242
CALCulate<n>:MARKer<m>:MAXimum:NEXT....242
CALCulate<n>:MARKer<m>:MAXimum:RIGHt....242
CALCulate<n>:MARKer<m>:MAXimum[:PEAK]....243
CALCulate<n>:MARKer<m>:MINimum:LEFT....243
CALCulate<n>:MARKer<m>:MINimum:NEXT....243
CALCulate<n>:MARKer<m>:MINimum:RIGHt....243
CALCulate<n>:MARKer<m>:MINimum[:PEAK]....243
CALCulate<n>:MARKer<m>:X....239
CALCulate<n>:MARKer<m>:Y?....217
CALCulate<n>:MARKer<m>[:STATe]....238
CALCulate<n>:UNIT:POWer....168
CONFigure:CDPower[:BTS]:BCLass|BANDclass....199
CONFigure:CDPower[:BTS]:CTABle:CATalog?....185
CONFigure:CDPower[:BTS]:CTABle:COMMent....188
CONFigure:CDPower[:BTS]:CTABle:COPY....186
CONFigure:CDPower[:BTS]:CTABle:DATA....188
CONFigure:CDPower[:BTS]:CTABle:DATA....190
CONFigure:CDPower[:BTS]:CTABle:DELete....187
CONFigure:CDPower[:BTS]:CTABle:NAME....191

CONFigure:CDPower[:BTS]:CTABle:RESTore....187
CONFigure:CDPower[:BTS]:CTABle:SELect....187
CONFigure:CDPower[:BTS]:CTABle[:STATe]....187
CONFigure:CDPower[:BTS]:MCARrier:FILTer:COFRequency....144
CONFigure:CDPower[:BTS]:MCARrier:FILTer:ROFF....144
CONFigure:CDPower[:BTS]:MCARrier:FILTer:TYPE....145
CONFigure:CDPower[:BTS]:MCARrier:FILTer[:STATe]....145
CONFigure:CDPower[:BTS]:MCARrier:MALGo....146
CONFigure:CDPower[:BTS]:MCARrier[:STATe]....146
CONFigure:CDPower[:BTS]:MEASurement....142
DIAGnostic:SERVice:NSOurce....165
DISPlay:FORMat....200
DISPlay:MTABle....241
DISPlay[:WINDow<n>]:SIZE....201
DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:AUTO ONCE....169
DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:MAXimum....169
DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:MINimum....169
DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:PDIVision....169
DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:RLEVel....170
DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:RLEVel:OFFSet....170
DISPlay[:WINDow<n>]:TRACe<t>:MODE....237
DISPlay[:WINDow<n>]:TRACe<t>[:STATe]....238
DISPlay[:WINDow<n>]:ZOOM:AREA....207
DISPlay[:WINDow<n>]:ZOOM:MULTiple<zoom>:AREA....208
DISPlay[:WINDow<n>]:ZOOM:MULTiple<zoom>:STATe....209
DISPlay[:WINDow<n>]:ZOOM:STATe....208
FORMat:DEXPort:DSEParator....232
FORMat[:DATA]....218
INITiate:CONMeas....210
INITiate:CONTinuous....211
INITiate:REFResh....248
INITiate:SEQuencer:ABORt....212
INITiate:SEQuencer:IMMediate....212
INITiate:SEQuencer:MODE....212
INITiate:SEQuencer:REFResh[:ALL]....213
INITiate[:IMMediate]....211
INPut:ATTenuation....171
INPut:ATTenuation:AUTO....172
INPut:ATTenuation:PROTection:RESet....150
INPut:CONNector....150
INPut:COUPling....150
INPut:DIQ:CDEVice....153
INPut:DIQ:RANGe:COUPling....155
INPut:DIQ:RANGe[:UPPer]....155
INPut:DIQ:RANGe[:UPPer]:AUTO....154
INPut:DIQ:RANGe[:UPPer]:UNIT....155
INPut:DIQ:SRATe....156
INPut:DIQ:SRATe:AUTO....156

INPut:EATT....172
INPut:EATT:AUTO....173
INPut:EATT:STATe....173
INPut:FILTer:HPASs[:STATe]....151
INPut:FILTer:YIG[:STATe]....151
INPut:GAIN:STATe....170
INPut:GAIN[:VALue]....171
INPut:IMPedance....151
INPut:IQ:BALanced[:STATe]....160
INPut:IQ:FULLscale:AUTO....161
INPut:IQ:FULLscale:LEVel....161
INPut:IQ:TYPE....161
INPut:SELect....152
INSTrument:CREate:DUPLicate....139
INSTrument:CREate:REPLace....139
INSTrument:CREate[:NEW]....139
INSTrument:DELete....140
INSTrument:LIST?....140
INSTrument:REName....141
INSTrument[:SELect]....142
LAYout:ADD[:WINDow]?....201
LAYout:CATalog[:WINDow]?....203
LAYout:IDENtify[:WINDow]?....203
LAYout:REMove[:WINDow]....204
LAYout:REPLace[:WINDow]....204
LAYout:SPLitter....204
LAYout:WINDow<n>:ADD?....206
LAYout:WINDow<n>:IDENtify?....206
LAYout:WINDow<n>:REMove....206
LAYout:WINDow<n>:REPLace....207
MMEMory:LOAD:IQ:STATe....245
MMEMory:STORe:IQ:COMMent....246
MMEMory:STORe:IQ:STATe....246
MMEMory:STORe<n>:TRACe....232
OUTPut:DIQ....156
OUTPut:DIQ:CDEVice....156
OUTPut:TRIGger<port>:DIRection....180
OUTPut:TRIGger<port>:LEVel....181
OUTPut:TRIGger<port>:OTYPe....181
OUTPut:TRIGger<port>:PULSe:IMMediate....181
OUTPut:TRIGger<port>:PULSe:LENGth....182
STATus:QUESTionable:DIQ:CONDition?....158
STATus:QUESTionable:DIQ:ENABle....159
STATus:QUESTionable:DIQ:NTRansition....159
STATus:QUESTionable:DIQ:PTRansition....159
STATus:QUESTionable:DIQ[:EVENt]?....159
STATus:QUESTionable:SYNC:CONDition?....249
STATus:QUESTionable:SYNC:ENABle....250

STATus:QUEStionable:SYNC:NTRansition....250
STATus:QUEStionable:SYNC:PTRansition....250
STATus:QUEStionable:SYNC[:EVENt]?....249
SYSTem:PRESet:CHANnel[:EXECute]....142
SYSTem:SEQuencer....214
TRACe<n>[:DATA]?....218
TRIGger[:SEQuence]:BBPower:HOLDoff....174
TRIGger[:SEQuence]:DTIMe....174
TRIGger[:SEQuence]:HOLDoff[:TIME]....175
TRIGger[:SEQuence]:IFPower:HOLDoff....175
TRIGger[:SEQuence]:IFPower:HYSTeresis....175
TRIGger[:SEQuence]:LEVel:BBPower....176
TRIGger[:SEQuence]:LEVel:IFPower....176
TRIGger[:SEQuence]:LEVel:IQPower....177
TRIGger[:SEQuence]:LEVel:RFPower....177
TRIGger[:SEQuence]:LEVel:VIDeo....177
TRIGger[:SEQuence]:LEVel[:EXTernal<port>]....176
TRIGger[:SEQuence]:SLOPe....177
TRIGger[:SEQuence]:SOURce....178
TRIGger[:SEQuence]:TIME:RINTerval....180
[SENSe:]ADJust:ALL....192
[SENSe:]ADJust:CONFigure:DURation....193
[SENSe:]ADJust:CONFigure:DURation:MODE....193
[SENSe:]ADJust:CONFigure:HYSTeresis:LOWer....194
[SENSe:]ADJust:CONFigure:HYSTeresis:UPPer....194
[SENSe:]ADJust:LEVel....194
[SENSe:]AVERage:COUNt....191
[SENSe:]CDPower:ANTenna....146
[SENSe:]CDPower:CODE....195
[SENSe:]CDPower:ICTReshold....185
[SENSe:]CDPower:IQLength....182
[SENSe:]CDPower:LCODe:MASK....148
[SENSe:]CDPower:LCODe:MODE....148
[SENSe:]CDPower:LCODe:OFFSet....148
[SENSe:]CDPower:LEVel:ADJust....251
[SENSe:]CDPower:MAPPing....195
[SENSe:]CDPower:NORMalize....196
[SENSe:]CDPower:ORDer....197
[SENSe:]CDPower:PDISplay....197
[SENSe:]CDPower:PNOFfset....147
[SENSe:]CDPower:PPReference....197
[SENSe:]CDPower:PREFerence....198
[SENSe:]CDPower:PRESet....252
[SENSe:]CDPower:QINVert....183
[SENSe:]CDPower:SET....195
[SENSe:]CDPower:SET:COUNt....183
[SENSe:]CDPower:SFACtor....198
[SENSe:]CDPower:SLOT....196

[SENSe:]CDPower:TPMeas....198
[SENSe:]FREQuency:CENTer....166
[SENSe:]FREQuency:CENTer:STEP....166
[SENSe:]FREQuency:CENTer:STEP:AUTO....167
[SENSe:]FREQuency:CENTer:STEP:LINK....167
[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor....167
[SENSe:]FREQuency:OFFSet....168
[SENSe:]MSRA:CAPTure:OFFSet....248
[SENSe:]PROBe<p>:ID:PARTnumber?....163
[SENSe:]PROBe<p>:ID:SRNumber?....163
[SENSe:]PROBe<p>:SETup:MODE....163
[SENSe:]PROBe<p>:SETup:NAME?....164
[SENSe:]PROBe<p>:SETup:STATe?....164
[SENSe:]PROBe<p>:SETup:TYPE?....165
[SENSe:]SWAPiq....162
[SENSe:]SWEep:COUNt....191

Index

A

Abbreviations 265
Aborting
  Sweep 98
AC/DC coupling 63
ACKCH 45
ACLR
  Bandclasses 104, 105, 199, 259
  cdma2000 results 29
  Configuring (cdma2000) 103
  Results (remote) 234
Activating
  cdma2000 measurements (remote) 138
Active channels 16
  Quasi-inactive 43
Active probe
  Microbutton 69
Adjacent channel leakage ratio
  see ACLR 29
Agilent
  Long code generation mode 40
Alias power 22, 39, 108, 198
Amplitude
  Analog Baseband Interface (B71) settings 78
  Configuration (softkey) 75
  Configuring (remote) 168
  Settings 75
Analog Baseband
  Amplitude settings 78
  Input 64
  Input settings 66
Analog Baseband (B71)
  Fullscale level 80
  I/Q mode 67
  Input type (remote control) 161
Analog Baseband Interface (B71)
  Amplitude settings 78
  Input settings 66
Analysis
  BTS Code Domain Settings 107
  Remote commands 236
  RF (remote) 200
  RF measurements 107
  Settings 107
Analysis interval
  MSRA 87, 88, 182
Analysis line 48
Antenna diversity 42
  Activating 58
  Activating (remote) 146
  Special channels 42
Antenna number
  Selecting 58
  Selecting (remote) 146
Applications
  Adopted parameters 53
  Switching 53
Attenuation 77
  Auto 77
  Configuring (remote) 171
  Electronic 77
  External 47
  Manual 77
  Option B25 77
  Protective (remote) 150
Auto all
  Softkey 99
Auto level
  Hysteresis 100
  Reference level 76, 80, 99
  Softkey 76, 80, 99
Auto scaling 81
Autosearch
  Channel detection 43
Auto settings 99
  Meastime Auto (softkey) 100
  Meastime Manual (softkey) 100
  Remote commands 192
Average count 97

B

Bandclasses
  ACLR 259
  Defining 104, 105, 199
  SEM 259
  Supported 259
Bandwidth
  Coverage, MSRA mode 48
  Menu 53
Base spreading factor 39, 108, 198
Base station
  see BTS 11
Base transceiver station
  see BTS 11
Bit-Reverse
  Code table 256
  Sort order 38, 109, 197
Bitstream
  Evaluation method 18
  Trace results 220
Branches 40
  Analysis 43
  Evaluation range 110, 195
  Retrieving 220
  Selecting 110, 195
BTS 11

C

Capture Length 88, 182
Capture offset
  MSRA applications 86, 88
  Remote 248
  Softkey 86
Carrier Frequency Error 16
CCCH 45
CCDF
  cdma2000 results 32
  Configuring (cdma2000) 106
CDA 15
  Analysis settings (BTS) 107
  Configuring 53
  Configuring (remote) 143
  Evaluation settings BTS (remote) 196

Parameters 16
Performing 120
Results 16
CDE
Peak 24
CDEP
Color assignment 22
Display 108, 198
Evaluation method 21
Trace results 224
cdma2000
Basics 36
Introduction 11
Measurements 15
Remote commands 133
cdma2000 mode
Error messages 119
Optimizing 119
Reference 253
RF measurements 28
Troubleshooting 119
CDP
Absolute/Relative 108, 197
Channel table 95, 97, 188, 190
Color assignment 22
Display 108, 197, 198
Evaluation method 21
Measurement examples 126
Reference power 108, 198
Results (remote) 215
Retrieving 220
Trace results 224
Triggered (Measurement example) 128
Center frequency 74
Analog Baseband (B71) 68
Deviation (Measurement example) 127
Softkey 74
Step size 74
Channel bandwidth
MSRA mode 48
Channel bar 13
Channel detection
Autosearch 43
Configuring 89
Methods 43
Predefined tables 43
Remote commands 183, 185
Search mode 90, 187
Softkey 89
Channel number 17, 20
Configuring in table 94, 96, 188, 190
Retrieving 220
Channel power
ACLR, see ACLR 29
Channels 36
Active 16, 90, 95, 97, 185, 190
Bandwidth 36
Bitstream 18
Evaluation range 109, 195
Inactive, showing 20
Number 36
Results 17
Selected (Display) 13
Status 20, 22, 23, 95, 97, 190
Threshold 23
Channel tables
Adding channels 93
CDP 95, 97, 188, 190
Channel number 94, 96, 188, 190
Channel status 95, 97, 188, 190
Channel type 94, 96, 188, 190
Comment 93, 188
Comparison 43
Configuring 20, 121, 190
Configuring (remote) 188
Copying 92, 186
Creating 92, 191
Creating from measurement 93, 142
Deleting 92, 187
Deleting channels 93
Details (BTS) 93
Details (MS) 95
Domain conflict 95, 97
Editing 92
Evaluation method 19
Managing 91
Managing (remote) 185
Mapping 97, 190
Name 93, 191
Parameters 20
Predefined 253
RC 95, 188
RECENT 91, 185
Results (remote) 218
Selected 91, 185
Selecting 91, 187, 191
Settings 92
Sorting 93
Trace results 220
Channel types
BTS 43
Configuring in table 94, 96, 188, 190
Detected 20, 43
Detected (BTS) 44
Detected (MS) 45
MS 44
Parameter values (remote) 183, 184
Retrieving 220
Special (BTS) 43
Special (MS) 45
Chip Rate Error 16
Results (remote) 215
Chips 37
Code class
Relationship to spreading factor 37
Relationship to symbol rate 37
Code Display Order 109, 197
Code domain 36
Code Domain Analysis
see CDA 15
Code Domain Error Power
see CDEP 21
Code Domain Power
see CDP 21
Code domain settings
Softkey 107
Code number
see Channel number 36
Selecting 109, 195
Code Power Display 197

Codes 36
Long 40
Mapping 40
Number per channel 37
Power display 108
Quasi-inactive 43
Short 40
Sorting 21, 38, 109, 197
Sorting order 21
Code tables 256
Complementary cumulative distribution function
see CCDF 32
Composite Constellation
Evaluation method 22
Trace results 228
Composite EVM 17
Evaluation method 23
Measurement examples 129
Trace results 228
Continue single sweep
Softkey 98
Continuous sweep
Softkey 98
Conventions
SCPI commands 134
Copying
Measurement channel (remote) 139
Coupling
Input (remote) 150
CQICH 45
Cut-off frequency
RRC filter 60, 62, 144

D

Data acquisition
MSRA 87, 88, 182
see Signal capturing 87
Data format
Remote 218
Data input 62
Data output 62
DCCH 45
DC offset
see IQ offset 108
Default values
Preset 54
Delta markers
Defining 114
Diagram footer information 14
Diagrams
Evaluation method 33
Differential input
Analog Baseband (B71, remote control) 160
Analog Baseband (B71) 68
DigIConf
Softkey, see also R&S DigIConf 66
Digital Baseband Interface (B17) 72
Connected instrument 73
Input settings 64
Input status (remote) 153
Output connection status (remote) 156
Output settings 72
Status registers 157
Digital I/Q
Connection information 73
Input connection information 66
Input settings 64
Output settings 72
Output settings information 72
Triggering 84
Digital input
Connection information 66
Digital output
Enabling 72
Display
Configuration, remote 251
Information 12
Display configuration
Softkey 15, 52
Domain conflict
Channel table 95, 97
Drop-out time
Trigger 85
Duplicating
Measurement channel (remote) 139

E

EACH 45
Electronic input attenuation 77
Eliminating
IQ offset 108, 196
Enhanced algorithm
Multi-carrier signals 59, 61, 146
Error messages 119
Errors
Device connections (B17) 157
IF OVLD 76, 79
Error vector magnitude
see EVM 23
Evaluation methods
Remote 201
Evaluation range
Branch 110, 195
Channel 109, 195
PCG 110, 196
Remote commands 195
Sets 88, 110, 195
Settings 107
Softkey 109
Evaluations
CDA 18
RF 33
see also Result Displays 15
Selecting 15
EVM
Composite 23
Results (remote) 215
vs Chip 229
vs symbol 17, 20, 27
Exporting
Functions 50
I/Q data 50, 53, 264
I/Q data (remote) 245
Softkey 50
Trace results (remote) 232
External trigger
Level (remote) 176
Softkey 83

F

FCH 45

F-CHAN 43
File format
I/Q data 260
Files
I/Q data binary XML 264
I/Q parameter XML 261
Filters
Cut-off frequency 60, 62, 144
High-pass (remote) 151
High-pass (RF input) 64
Multi-carrier signals 41, 59, 61, 145
Roll-off factor 59, 62, 144
YIG (remote) 151
Filter types
Multi-carrier 59, 61, 145
Format
Data (remote) 218
F-PDCCH 43
F-PDCH 43
F-PICH 43, 44
Free Run
Trigger (softkey) 83
Frequency
Configuration (remote) 166
Configuration (softkey) 73
Frequency error
Measurement examples 126
Results (remote) 215
vs PCG 229
Frequency offset 74
Frontend
Configuring 73
Configuring (remote) 165
F-SYNC 43
F-TDPICH 43, 44
Fullscale level
Analog Baseband (B71, remote control) 161
Analog Baseband (B71) 80
Full scale level
Digital I/Q 65
Digital I/Q (remote) 154, 155
Unit, digital I/Q (remote) 155

H

Hadamard
Code table 256
Sort order 38, 109, 197
Hardware settings
Displayed 13
High-pass filter
Remote 151
RF input 64
Hysteresis
Lower (Auto level) 100
Trigger 85
Upper (Auto level) 100

I

I/Q data
Export file binary data description 264
Export file parameter description 261
Exporting 50, 53
Exporting (remote) 245
Importing 51, 53
Importing/Exporting 50
Importing (remote) 245
I/Q Power
Trigger level (remote) 177
IF Power
Trigger (softkey) 84
Trigger level (remote) 176
Impedance
Remote 151
Setting 63
Importing
Functions 50
I/Q data 50, 51, 53, 261
I/Q data (remote) 245
Softkey 51
Inactive Channel Threshold 90, 185
Input
Analog Baseband Interface (B71) settings 66
Connector (remote) 150
Coupling 63
Coupling (remote) 150
Digital Baseband Interface (B17) settings 64
Overload (remote) 150
RF 63
Settings 62, 78
Source, Analog Baseband 67
Source, connection errors 157
Source, digital I/Q 65
Source, Radio frequency (RF) 63
Source Configuration (softkey) 62
Input sample rate (ISR)
Digital I/Q 65
Installation 11
Invert Q 88, 183
IQ imbalance 17
Results (remote) 215
IQ offset
Eliminating 108, 196
Results (remote) 215

K

Keys
BW 53
LINES 53
MKR -> 117
MKR FUNCT 53
Peak Search 118
RUN CONT 98
RUN SINGLE 98
SPAN 53

L

Lines
Menu 53
Loading
Functions 50
Long codes 40
Agilent signals 40
Generation 40, 61
Generation (remote) 148
Mask 60
Mask (remote) 148
Offset 61
Offset (remote) 148
Scrambling 40

Lower Level Hysteresis
Softkey ... 100
Low-pass filter
Multi-carrier ... 59, 61, 145

M

Mag Error vs Chip
Trace results ... 229
Mapping ... 17, 20, 40
Channel table ... 97, 190
I/Q branches ... 97, 190
Retrieving ... 220
Selecting ... 110, 195
Marker Functions
Menu ... 53
Markers
Configuring ... 112
Configuring (remote) ... 238, 241
Configuring (softkey) ... 112
Deactivating ... 115
Delta markers ... 114
Minimum ... 118
Next minimum ... 118
Next peak ... 117
Peak ... 118
Positioning ... 117
Positioning (remote) ... 241
Querying position (remote) ... 217
Search settings ... 116
Settings (remote) ... 238
Setting to PICH ... 118
Setting to TDPICH ... 118
State ... 114
Table ... 115
Table (evaluation method) ... 34
Type ... 114
Marker table
Configuring ... 115
Evaluation method ... 34
Maximizing
Windows (remote) ... 201
Maximum
Y-axis ... 81
Measurement channel
Activating (remote) ... 138
Creating (remote) ... 139
Deleting (remote) ... 140
Duplicating (remote) ... 139
Querying (remote) ... 140
Renaming (remote) ... 141
Replacing (remote) ... 139
Measurement examples ... 124
CDP ... 126
Center frequency deviation ... 127
Composite EVM ... 129
Frequency error ... 126
PCDE ... 130
RHO factor ... 130
SEM ... 125
Signal channel power ... 124
Synchronization ... 127
Triggered CDP ... 128
Trigger offset ... 129
Wrong PN offset ... 129
Measurements
Results (remote) ... 215
RF ... 28
Selecting ... 52, 57
Selecting (remote) ... 142
Starting (remote) ... 209
Types ... 15
Measurement time
Auto settings ... 100
Microbutton
Probes ... 69
Minimum
Marker positioning ... 118
Next ... 118
Softkey ... 118
Y-axis ... 81
MKR ->
Key ... 117
Modulation
Accuracy ... 23
Bits per symbol ... 38
Inverted (I/Q, remote) ... 162
Inverted (I/Q) ... 68
Symbol constellation ... 38
Type ... 17
MS (Mobile station) ... 11
MSRA
Analysis interval ... 87, 88, 182
Operating mode ... 47
MSRA applications
Capture offset ... 86, 88
Capture offset (remote) ... 248
MSR ACLR
Results (remote) ... 234
MSRA Master
Data coverage ... 48
Multi-carrier
Algorithm ... 59, 61, 146
Carrier detection ... 59, 61, 146
Filter ... 59, 61, 145
Filters ... 41
Filter types ... 59, 61, 145
Mode ... 41, 59, 61
Multiple
Measurement channels ... 12, 52
Multiple zoom ... 101

N

Next Minimum
Marker positioning ... 118
Softkey ... 118
Next Peak
Marker positioning ... 117
Softkey ... 117
Noise
Source ... 70

O

OBW
cdma2000 results ... 31
Configuring (cdma2000) ... 105
Occupied bandwidth
see OBW ... 31

Offset 17
Analysis interval 86
Frequency 74
Reference level 76, 79
Optimizing
Test setup 119
Options
Electronic attenuation (B25) 77
High-pass filter (B13) 64, 151
Preamplifier (B24) 78
Output
Configuration (remote) 165
Configuration (softkey) 69
Digital Baseband Interface (B17) settings 72
Digital Baseband Interface (B17) status 156
Digital I/Q (remote) 156
Noise source 70
Power measurement, Configuring 102
Settings 69
Trigger 70, 86
Overload
RF input (remote) 150
Overview
Configuring cdma2000 55

P

Parameters
CDA 16
Channels 17
Channel table 20
PCDE
Evaluation method 24
Measurement examples 130
Trace results 229
PCG 15
Captured 182
Display 13
Evaluation range 110, 196
Number of symbols 36
Power 25
Results 16
Selecting 110, 196
PCGs 36
Captured 88
Peak Code Domain Error
see PCDE 24
Peak list
Evaluation method 34
Peaks
Marker positioning 118
Next 117
Softkey 118
Peak search
Key 118
Mode 116
Performing
cdma2000 measurement 120
Phase Discontinuity vs PCG
Trace results 229
Phase Error vs Chip
Trace results 230
Phase offset 17, 20
Calculating 108, 198
Results (remote) 215, 218
Retrieving 220
PICH 45
Power reference 108, 198
Softkey 118
Pilot
Power 17
Pilot Power
K83 108
PN offset 40, 58, 147
False (Measurement example) 129
Power
Absolute 17, 20
Alias 22, 39
Channels 17, 20, 28, 102
Pilot 17
Reference 108, 198
Reference (Display) 13
Relative 17, 20
Threshold 90, 185
Total 17
vs PCG 25
vs symbol 25
Power control groups
see PCG 15, 36
Power vs PCG
Evaluation method 25
Trace results 229
Power vs Symbol
Evaluation method 25
Trace results 230
Preamplifier
Setting 78
Softkey 78
Predefined channel tables
Antenna diversity 42
BTS 253, 255
BTS application 91
BTS mode 185
Channel detection 43
MS application 91
MS mode 185
Provided 91, 185
Restoring 92, 187
Using 90, 187
Presetting
Channels 56, 252
Default values 54
Pre-trigger 85
Probes
Microbutton 69
Settings 69
Protection
RF input (remote) 150

Q

Quasi-inactive codes 43

R

R&S DigIConf 66
R&S EX-IQ-BOX
DigIConf 66
Radio configuration
see RC 20, 41
Range
Scaling 81

RC 20, 41
BTS application 41
Channel table 95, 188
Channel tables 253
Retrieving 220
Reference level
Auto level 76, 80, 99
Digital I/Q 66
Offset 76, 79
Offset (softkey) 76, 79
Softkey 76, 79
Unit 76, 79
Value 76, 79
Reference power 108, 198
Refreshing
MSRA applications (remote) 248
Remote commands
Basics on syntax 133
Boolean values 137
Capitalization 134
Character data 137
Data blocks 138
Numeric values 136
Obsolete 250
Optional keywords 135
Parameters 136
Strings 138
Suffixes 135
Resetting
RF input protection 150
Restoring
Channel settings 56, 252
Predefined channel tables 92, 187
Result displays
CDA 18
Channel Bitstream 18
Code Domain Error Power 21
Code Domain Power 21
Composite Constellation 22
Composite EVM 23
Configuring 52
Configuring (remote) 200
Diagram 33
Marker table 34
Peak Code Domain Error 24
Peak list 34
Power vs PCG 25
Power vs Symbol 25
Result Summary 26, 34
see also Evaluations 15
Symbol Constellation 26
Symbol EVM 27
Results
Calculated (remote) 215
CDP (remote) 215
Data format (remote) 218
Evaluating 107
Exporting (remote) 232
Retrieving (remote) 214
RF (remote) 233
Trace (remote) 217
Trace data (remote) 218
Trace data query (remote) 219, 220
Updating the display (remote) 248
Result Summary
Channel results 17
Evaluation method 26, 34
General Results 16
PCG results 16
Result display 34
Trace results 230
Retrieving
Calculated results (remote) 215
Results (remote) 214
RF Results (remote) 233
Trace results (remote) 217
RF attenuation
Auto (softkey) 77
Manual (softkey) 77
RF input 63
Connector (remote) 150
Overload protection (remote) 150
Remote 149, 152
RF measurements
Analysis 107
Analysis (remote) 200
cdma2000 28
Configuring 102
Configuring (remote) 199
Performing 122
Results 28
Results (remote) 233
Selecting 102
Types 28
RF Power
Trigger level (remote) 177
RF signal power 28, 102
RHO factor 17
Measurement examples 130
Results (remote) 215
Roll-off factor
RRC filter 59, 62, 144
RRC filter
Multi-carrier 145
RRC Filter
Cut-off frequency 60, 62, 144
Multi-carrier 59, 61
Roll-off factor 59, 62, 144
RUN CONT
Key 98
RUN SINGLE
Key 98

S

S1CH 45
Sample rate 88
Configuring in channel table 94, 97
Digital I/Q 65
Digital I/Q (remote) 156
Saving
Functions 50
Scaling
Amplitude range, automatically 81
Configuration, softkey 81
Y-axis 81
Scrambling 40
Select Marker
Softkey 113
Select meas 52
SEM
Bandclasses 104, 105, 199, 259
cdma2000 results 30
Configuring (cdma2000) 104

Measurement examples ... 125
Results (remote) ... 218
Sequencer ... 12, 52
Aborting (remote) ... 212
Activating (remote) ... 212
Mode (remote) ... 212
Remote ... 211
Sets
Captured ... 88, 183
Definition ... 36
Evaluation range ... 88, 110, 195
Selecting ... 88, 110, 195
Stored ... 88, 183
Settings
Overview ... 55
Show inactive channels ... 20
Signal capturing
Remote commands ... 182
Softkey ... 87
Signal channel power
Measurement examples ... 124
Signal description
BTS (remote) ... 144
BTS Configuration ... 57
Configuring ... 57
MS (remote) ... 147
MS Configuration ... 60
Remote commands ... 144
Softkey ... 57
Signal source
Remote ... 152
Single sweep
Softkey ... 98
Single zoom ... 101
Slope
Trigger ... 85, 177
Softkeys
Amplitude Config ... 75
Auto All ... 99
Auto Level ... 76, 80, 99
Bandclasses ... 104, 105
Capture Offset ... 86
Center ... 74
Channel Detection ... 89
Code Domain Settings ... 107
Continue Single Sweep ... 98
Continuous Sweep ... 98
DigIConf ... 66
Digital I/Q ... 84
Display Config ... 15, 52
Evaluation Range ... 109
Export ... 50
External ... 83
Free Run ... 83
Frequency Config ... 73
IF Power ... 84
Import ... 51
Input Source Config ... 62
IQ Export ... 50
IQ Import ... 51
Lower Level Hysteresis ... 100
Marker Config ... 112
Meastime Auto ... 100
Meastime Manual ... 100
Min ... 118
Next Min ... 118
Next Peak ... 117
Norm/Delta ... 114
Outputs Config ... 69
Peak ... 118
PICH ... 118
Preamp ... 78
Ref Level ... 76, 79
Ref Level Offset ... 76, 79
RF Atten Auto ... 77
RF Atten Manual ... 77
Scale Config ... 81
Select Marker ... 113
Signal Capture ... 87
Signal Description ... 57
Single Sweep ... 98
Sweep Config ... 97
Sweep count ... 97
TDPICH ... 118
Trace Config ... 111
Trigger Config ... 81
Trigger Offset ... 85
Upper Level Hysteresis ... 100
Sort order
Bit-Reverse ... 38
Codes ... 21, 109, 197
Hadamard ... 38
Span
Menu ... 53
Special channels
ACKCH ... 45
BTS ... 43
CCCH ... 45
CQICH ... 45
DCCH ... 45
EACH ... 45
FCH ... 45
F-CHAN ... 43
F-PDCCH ... 43
F-PDCH ... 43
F-PICH ... 43
F-SYNC ... 43, 44
F-TDPICH ... 43, 44
MS ... 45
PICH ... 45
S1CH ... 45
Transmit diversity ... 44
Specifics for
Configuration ... 57
Spectrum Emission Mask
see SEM ... 30
Spreading factor ... 20, 36, 37
Base ... 24
Display ... 108, 198
Querying (remote) ... 215
Relationship to code class ... 37
Relationship to symbol rate ... 37
Status
Bar ... 14
Channels ... 20, 95, 97, 190
Status registers
Contents ... 248
Querying ... 248
STAT:QUES:POW ... 150
STATus:QUEStionable:DIQ ... 157
Suffixes
Common ... 138
Remote commands ... 135

Swap IQ 68
Remote 162
Sweep
Aborting 98
Configuration (softkey) 97
Configuring (remote) 191
Count 97
Symbol Constellation 26
Evaluation method 26
Trace results 231
Symbol EVM 17, 20
Evaluation method 27
Trace results 231
Symbol Magnitude Error
Trace results 232
Symbol Phase Error
Trace results 232
Symbol rate 20, 36
Display 13
Relationship to code class 37
Relationship to spreading factor 37
Symbols
Constellation 26
Number per PCG 36
Power 25
Synchronization
Reference frequencies 127

T

TDPICH
Softkey 118
Test setup 45
Connections 46
Equipment 46
Presettings 47
Threshold
Active channels 90, 185
Timing offset 17, 20
Calculating 108, 198
Results (remote) 215, 218
Retrieving 220
Title bar
Window 14
Traces
Configuration (softkey) 111
Configuring (remote) 237
Exporting (remote) 232
Mode 111
Mode (remote) 237
Results (remote) 217, 218, 219, 220
Transmit diversity 42
Number of symbols 36
Required channels 44
Trigger
Adjusting (Measurement example) 129
CDP (Measurement example) 128
Configuration (remote) 173
Configuration (softkey) 81
Drop-out time 85
External (remote) 178
Holdoff 85
Hysteresis 85
Level 84
Offset (softkey) 85
Output 70, 86
Slope 85, 177
Trigger level
External trigger (remote) 176
I/Q Power (remote) 177
IF Power (remote) 176
RF Power (remote) 177
Trigger source 83
Digital I/Q 84
External 83
Free Run 83
IF Power 84
Trigger to frame 16
Querying (remote) 215
Troubleshooting 119
Input overload 150

U

UE (User equipment)
see MS (Mobile station) 11
Units
Reference level 76, 79
Updating
Result display (remote) 248
Upper Level Hysteresis
Softkey 100
User manuals 8

W

Walsh code 20
Windows
Adding (remote) 201
Closing (remote) 204
Configuring 57
Layout (remote) 204
Maximizing (remote) 201
Querying (remote) 203
Replacing (remote) 204
Splitting (remote) 201
Title bar 14
Types (remote) 201

X

X-value
Marker 114

Y

YIG-preselector
Activating/Deactivating 64
Activating/Deactivating (remote) 151
Y-maximum, Y-minimum
Scaling 81

Z

Zooming
Activating (remote) 208
Area (Multiple mode, remote) 208
Area (remote) 207
Deactivating 101
Multiple mode 101
Multiple mode (remote) 208, 209
Remote 207
Restoring original display 101

Single mode 101
Single mode (remote) 207